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M-X ENVIRONMENTAL TECHNICAL REPORT. SOCIAL MODEL.(U)
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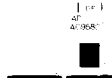

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SECURITY CLASSIFICATION OF THIS PAGE (When Date Entered)

(19) REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER (18) AFSC TR-81-43	2. GOVT ACCESSION NO. AD-095801	3. RECIPIENT'S CATALOG NUMBER (9)
4. TITLE (and Subtitle) (6) M-X Environmental Technical Report, - Social Model,		5. TYPE OF REPORT & PERIOD COVERED Final Report,
		6. PERFORMING ORG. REPORT NUMBER MX ETR 28
7. AUTHOR(s) (14) M-X-ETR-28		8. CONTRACT OR GRANT NUMBER(s) (15) F04704-78-C-0029
9. PERFORMING ORGANIZATION NAME AND ADDRESS Henningson, Durham and Richardson Santa Barbara CA 93010		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS (12) 95 64312F
11. CONTROLLING OFFICE NAME AND ADDRESS Ballistic Missile Office (11) Norton AFB CA		12. REPORT DATE 22 Dec [redacted]80
		13. NUMBER OF PAGES 93
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)		15. SECURITY CLASS. (of this report) Unclassified
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Unclassified/Unlimited

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

MX	Socioeconomic Impact
Siting Analysis	SIAM Model
Environmental Report	CRIM Model

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

SIAM is a set of formal mathematical models which have been designed to provide quantitative projections of the effects ofprojects such as the M-X system on communities and regions in each of the topics mentioned above. The group of linked, computer-based models provides a comprehensive analytical framework that is sensitive to variations in the project's location, size, and other characteristics, and to baseline differences among communities. The package consists of the following groups of models: (continued on reverse)

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Unclassified 4/12 198

SECURITY CLASSIFICATION OF THIS PAGE (When Date Entered)

Item 20 continued

- Economic
- Demographic
- Housing
- Community Land Use and Infrastructure
- Community Services and Facilities
- Public Finance

M-X ETR-28

M-X ENVIRONMENTAL TECHNICAL REPORT: SOCIAL MODEL

Prepared for

U.S. Air Force
Ballistic Missile Office
Norton AFB, California

by

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804 Anacapa Street
Santa Barbara, California

22 December 1980

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1.0 INTRODUCTION AND OVERVIEW OF THE COMMUNITY SOCIOECONOMIC IMPACT ASSESSMENT MODEL (SIAM) PACKAGE

1.1 INTRODUCTION

Large-scale projects such as the M-X system are likely to result in transformations of communities and regions that are initially of small size. These socioeconomic changes would be induced during construction and operations phases of the project by expenditures for materials procurement and by direct employment of substantial numbers of workers. The direct economic effects are multiplied within the local economy to produce a larger total expansion of output and employment. One of the more immediate consequences of large-scale economic expansion in local areas which have a small available labor force would be rapid population growth as people move into the region to take advantage of the employment opportunities generated by the project.

Many of the key socioeconomic issues are related to the ability of small communities and sparsely populated regions to absorb rapid, large-scale economic and population growth without excessive disruption or deterioration in living conditions. Transformations may be expected in the demographic profiles of communities, in local markets for goods and services, in requirements for a stock of physical capital such as housing and other types of buildings, in requirements for conversion of land to urban uses, in needs for public and private infrastructure such as streets and utilities, in needs for various public services and facilities, and in the size and pattern of local government revenues and expenditures. Concern about these types of issues is heightened by the possibility that a period of rapid expansion during the construction phase of the project (the so-called "boom") may be followed by an equally abrupt period of shrinkage (or "bust") when construction is completed. This "boom-bust" cycle may be especially significant in situations where construction employment greatly exceeds permanent operations employment, as in counties that are affected only by DDA facility construction rather than by operating bases.

SIAM is a set of formal mathematical models which have been designed to provide quantitative projections of the effects of projects such as the M-X system on communities and regions in each of the topics mentioned above. The group of linked, computer-based models provides a comprehensive analytical framework that is sensitive to variations in the project's location, size, and other characteristics, and to baseline differences among communities. The package consists of the following groups of models:

- Economic
- Demographic
- Housing
- Community Land Use and Infrastructure
- Community Services and Facilities
- Public Finance

Figure 1-1 shows the overall structure of the models and their linkages. This report presents a detailed description of the housing, land use, and community services model groups, while economic/demographic and public finance models are discussed in separate technical reports.

1.2 THE COMMUNITY AND REGIONAL IMPACT MODELS (CRIM)

The community and regional impact models consist of three groups--housing, land use and infrastructure, and community services and facilities. The various submodels are described in Table 1.2-1 in terms of their input variables and constants and output variables, including their level of geographical and substantive detail. The three groups of community models are basically driven, with several exceptions, by changes in population size, composition, and spatial distribution. The exceptions are in the areas of housing and land use, where the computed impacts are also a function of economic variables such as employment, personal income, and consumer expenditure patterns.

1.3 GENERAL CHARACTERISTICS OF THE COMMUNITY AND REGIONAL IMPACT MODELS

All three model groups may be specified in a generalized form or made location-specific by the adjustment of certain parameters to correspond to local data. For purposes of assessment of the M-X project, parameters which express normative standards for various services are specified uniformly for all communities, while other types of parameters are allowed to vary from one place to another. Depending upon the purposes of an analysis, varying degrees of geographical and substantive detail may be provided. These model characteristics and their application to the M-X project may be summarized as follows:

- o Demographic detail. The models are capable of differentiating as many as eight different project-related population groups. Each of the submodels may be run separately for each population group so as to isolate the effects associated with that segment of the population. For the M-X analysis, population groups are differentiated in terms of project-related employment categories, with four types of temporary or construction population (OB construction and cluster construction, OB base assembly and checkout, and cluster assembly and checkout), three types of operations population (military officers, military enlisted personnel, and direct civilian employees), and the project-induced indirect population generated to provide local goods and services.

- o Geographic detail - place of residence. The model allocates population among several different geographical or spatial categories. First, for the M-X analysis, the various categories of population are allocated to residential locations either on the operations base, in construction camps, or in local communities. At a second level, the population in local communities is allocated to different geographical areas which correspond to governmental jurisdictions, such as cities, counties, and school districts. Totals for larger regions are formed by aggregating governmental jurisdictions such as counties.

- o Geographic Detail - region of impact analysis. These may correspond to any geographic area which may be formed by aggregating small govern-

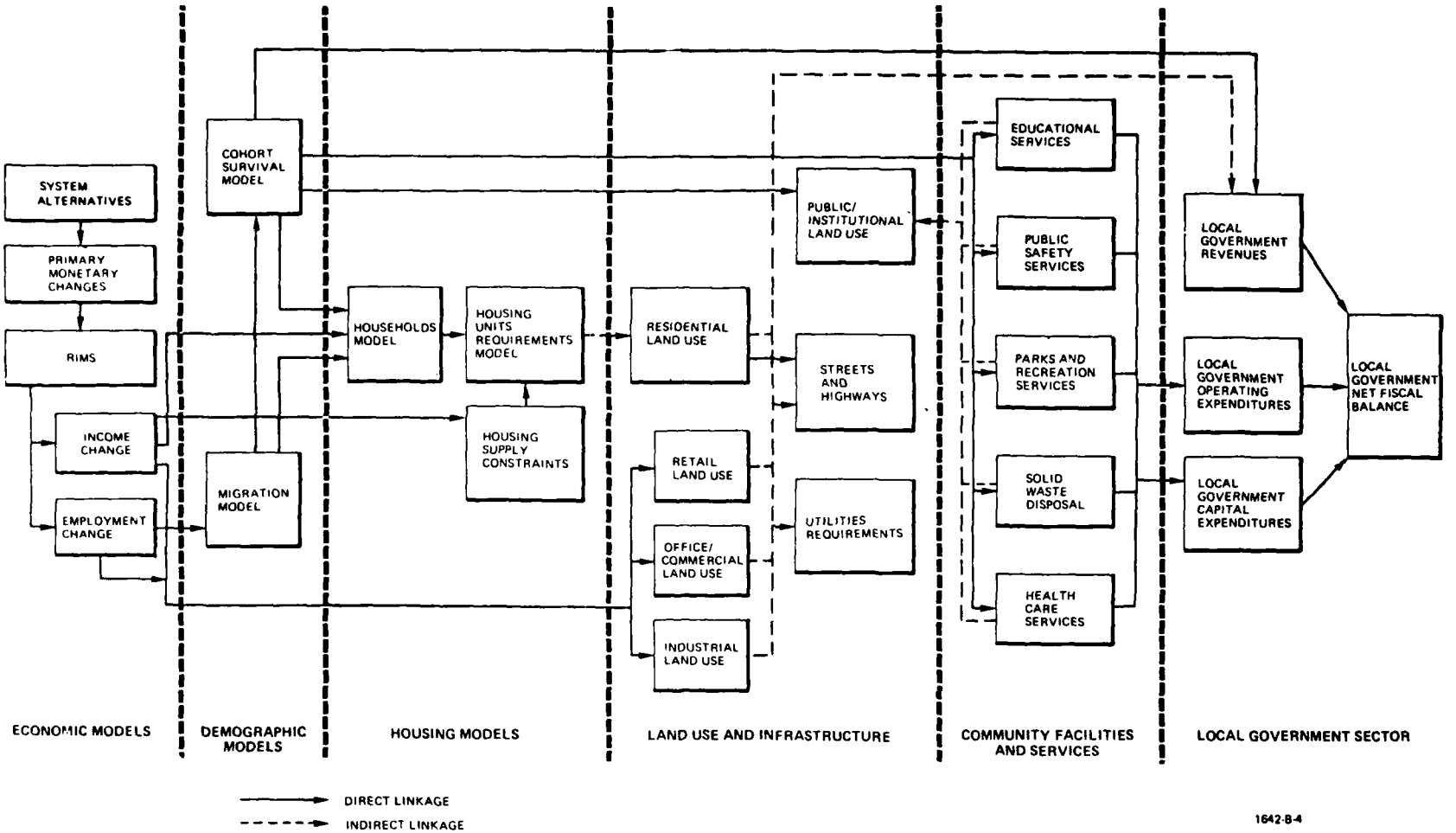

Figure 1-1. Schematic diagram of socioeconomic impact models and their linkages.

Table 1.2-1. Selected characteristics of the socioeconomic impact models (page 1 of 3).

MODEL GROUP	SUB-MODEL	INPUTS		OUTPUTS		
		VARIABLES	CONSTANTS	VARIABLES	GEOGRAPHIC DETAIL	DEMOGRAPHIC DETAIL
Housing	Households	• Population matrix of 7 population categories by 3 places of residence	• Vector of household sizes for 7 population categories	• Vector of number of households for 7 population categories	• 1 place of residence local communities; • appropriate number of governmental jurisdictions	• 7 population categories base construction, cluster construction, base A & CO., cluster A & CO., military and civilian operations, and indirect
	Housing Requirements	• Vector of number of households in 7 population categories • Time-varying matrix of proportion of housing units required for 3 housing types and 7 population categories	• Vacancy and replacement allowance factor (.05)	• Matrix of housing units required for 3 housing types and 7 population categories • Vector of annual construction or removals for 3 housing types	• Base • Construction camps • Local communities • Appropriate governmental jurisdictions	• 7 Population categories as above
Land Use and Infrastructure	Residential Land Use	• Vector of number of housing units for 3 housing types	• Vector of density for 3 housing types	• Vector of land area required to accomodate three housing types	• Local communities • Appropriate governmental jurisdictions	• 7 population categories
	Retail Land Use	• Matrix of aggregate disposal income for 7 population categories and 3 places of residence	• Proportion of income spent on retail goods • Matrix of proportions of retail expenditures that are local for 7 population groups and 3 places of residence • Land requirements per unit of retail building space • Construction cost per unit of building area for retail buildings	• Matrix of retail sales for 7 population groups and 3 places of residence • Matrix of building area required for 7 population groups and 3 places of residence • Vector of retail land required for 7 population groups • Cost of retail construction	• Local communities • Appropriate governmental jurisdictions	• 7 Population categories
	Commercial Office Land Use	• Matrix of aggregate disposable income for 7 population categories and 3 places of residence	• Proportion of income spent on services • Matrix of proportion of service expenditures that are local for 7 population groups and 3 places of residence • Value of services per unit of building space • Construction cost per unit of building space • Land requirements per unit of building space	• Matrix of service expenditures for 7 population groups and 3 places of residences • Matrix of building area required (3X7) • Vector of commercial office land required for 7 population categories • Cost of office /commercial construction	• Local communities • Appropriate governmental jurisdictions	• 7 population categories
	Industrial Land Use	• Total indirect employment	• Proportion of indirect employment in industrial categories • Building space requirements per employee • Land requirements per unit of building space • Construction costs per unit of building space	• Industrial building space required • Industrial land requirements • Cost of industrial construction	None	None

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Table 1.2-1. Selected characteristics of the socioeconomic impact models (page 2 of 3).

MODEL GROUP	SUB-MODEL	INPUTS		OUTPUTS		
		VARIABLES	CONSTANTS	VARIABLES	GEOGRAPHIC DETAIL	DEMOGRAPHIC DETAIL
Land Use and Infrastructure (Continued)	Streets and Highways	• Vector of housing units by 3 types	• Matrix of linear feet of streets required per housing unit for 3 categories of streets and 3 housing types • Matrix of linear feet of non-residential streets required per housing unit for 3 categories of streets and 3 housing types • Vector of right-of-way width for 3 street types • Vector of construction cost per linear foot for 3 street categories	• Vector of linear feet of street required for 3 housing types • Vector of non-residential street requirements in linear feet for 3 housing types • Vector of land area required for 3 street categories • Vector of construction costs for 3 street categories	• Local communities; • Appropriate governmental jurisdictions	None
	Public Land Use	• Matrix of number of pupils by 7 population categories and 3 places of residence • Population matrix of 7 population categories by 3 places of residence	• Educational facility land requirements per pupil • Vector of park land requirements per person for 3 types of parks	• Vector of educational facility land requirements by 3 school levels • Vector of park land required for 3 types of parks	• Local communities • Appropriate governmental jurisdictions • Base	None
	Utility Requirements Costs	• Vector of number of housing units for 3 types of housing	• Vector of sanitary sewer costs per unit for 3 types of housing units • Non-residential sewer cost factor • System-wide sewer cost factor • Vector of water system costs per unit for 3 types of housing units • Non-residential water system cost factor • System-wide water development cost • Vector of electric utility development costs per unit for 3 types of residential units • Non-residential electric development cost factor • System-wide electric utility development costs	• Vector of sanitary sewer development costs for 3 categories: residential, non-residential, and system-wide • Vector of water system development costs for 3 categories: residential, non-residential, and system-wide • Vector of electric system development costs for 3 categories: residential, non-residential, and system-wide	• Local communities • Appropriate governmental jurisdictions	None
Community Facilities and Services	Public Schools	• Household matrix with 7 categories of population by 3 places of residence	• Matrix of number of pupils per household for 7 population categories and 3 places of residence • Vector of number of pupils per teacher for 3 grade levels • Vector of number of pupils per school facility for 3 school types	• Matrix of number of pupils for 3 grade levels and 3 places of residence • Matrix of number of teachers required for 3 grade levels and 3 places of residence • Matrix of number of schools required for 3 grade levels and 3 places of residence		

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Table 1.2-1. Selected characteristics of the socioeconomic impact models (page 3 of 3).

MODEL GROUP	SUB-MODEL	INPUTS		OUTPUTS		
		VARIABLES	CONSTANTS	VARIABLES	GEOGRAPHIC DETAIL	DEMOGRAPHIC DETAIL
Community Facilities and Services (Continued)	Public Schools (Continued)		• Vector of square feet of school space required per pupil for 3 grade levels • School construction cost per unit of building space	• Vector of school construction cost for 3 grade levels	• Local communities • Base	• 7 population categories (for selected variables only)
	Public Safety	• Population matrix of 7 population categories and 3 places of residence	• Matrix of population per fire fighter for 7 population categories and 3 places of residence • Matrix of population per law enforcement officer for 7 population categories and 3 places of residence	• Number of fire fighter personnel required • Number of law enforcement personnel required	• Local communities	None
	Parks and Recreation	• Population matrix of 7 population categories and 3 places of residence	• Vector of park land requirements per person for 3 categories of parks	• Vector of park land required for 3 park categories	• Local communities	None
	Solid Waste Disposal	• Population matrix of 7 population categories and 3 places of residence	• Vector of volume of waste generated per person for 7 population categories • Vector of weight of waste generated per person for 7 population categories • Vector of land area required per person for disposal for 7 population categories	• Volume of solid waste generated • Weight of solid waste generated • Land area required disposal	• Local communities	None
	Health Care	• Population matrix of 7 population categories and 3 places of residence	• Vector of population per physician for 7 population categories • Vector of population per registered nurse for 7 population categories • Vector of population per dentist for 7 population categories • Vector of population per mental health professional • Vector of population per other type of health workers • Vector of population per hospital bed	• Number of physicians required • Number of nurses required • Number of dentists required • Number of mental health, personnel required • Number of other health personnel required • Number of hospital beds required	• Local communities	None

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ment jurisdictions for which data series are available, such as cities and counties. These may include states, groupings of states, and sub-state regions. Only those impacts which occur within the appropriately defined region are computed.

- o Time Frame for Impact Projection. Impacts are computed annually with separate tabulations of the cumulative impact from year zero and the net additional impact occurring in a given year.

- o Impacts Related to Project Parameters. Impacts may be computed for each element or phase of a project, such as construction, operations, and indirect effects. For the M-X project, five different project activities are distinguished: base construction, cluster (technical facility) construction, base assembly and checkout, cluster assembly and checkout, and operations. In addition, for the operations phase, different base sizes in terms of military personnel, civilian employment, and procurement expenditures are analyzed. The user can specify and evaluate various scenarios by providing appropriate project descriptive data for input to the models.

- o Mode of analysis. The models can be run in three modes: (1) baseline socioeconomic change with no project, (2) net project-related socioeconomic impact, and (3) total or cumulative socioeconomic change in an area due to the M-X project and other sources of change.

In the following sections, the general structure, assumptions, and logic of the models are discussed for each model individually along with examples of the models' summary output tables and their interpretation. Unsummarized model outputs and population data by employment category and place of residence are shown in Appendix Table A-1.

2.0 HOUSING SECTOR MODEL GROUP

2.1 MODEL STRUCTURE AND DESCRIPTION

The purpose of this sub-model is to develop quantitative projections, on a year by year basis, of the number of project-related households expected to reside in local communities and the number and type of housing units that must be provided (or removed) in order to accommodate them. This is accomplished in four steps: a) estimation of the number of M-X-related in-migrant households by employment category of the principal wage earner in a household, b) projection of total requirements for housing units to accommodate households allowing for a "normal" or frictionless vacancy rate, c) estimates of constraints on the production of new dwellings in housing markets which are initially very small, and d) projection of likely changes in housing supply as a consequence of the M-X project. The following sections describe the computational procedures, assumptions, and underlying rationale for each of these routines.

2.1.1 Households and Housing Demand

The inputs to this sub-model are a vector of population, consisting of seven project-related employment categories, and a corresponding vector of average household size for each population category. The population vector is that subset of total project-induced population growth which is projected to reside in communities and excludes construction workers in temporary construction camps and 80 percent of the military personnel, who are assumed to reside on the Air Force base. The number of households is computed by dividing the population vector by the average household size vector, which is derived from sample data available from secondary sources for each of the source groups for M-X-related in-migrant population. These constants and their sources are as follows:

Household Category	Average Household Size	Source/Reference
Construction Workers (family households)	3.5	Mountain West Research, Inc., Construction Worker Profile Final Report, 1975
Military (family households)	3.3	Base TAB A-1's and Bureau of the Census
Civilian & Indirect (all households)	2.8	Bureau of the Census, 1979

The household size parameters for the first two categories, construction worker and military workers, include only that portion of the population which is present in family household, since it is assumed that construction workers present without families and single Air Force personnel would reside in group housing. Housing services for these latter two groups would be obtained either from construction contractors or the Air Force, rather than in local housing markets. Unlike construction workers and military personnel, civilian operations and indirect

workers present in local communities would consist of households composed both of families and unrelated individuals. The average household size, estimated from recent national data from the Bureau of the Census, is correspondingly lower for these population groups. In addition, this procedure assumes that civilian in-migrants would be drawn from throughout the nation. The total number of households which would compete in local housing markets for their housing services is the sum of the number of households computed for each of the population categories.

In addition to the number of in-migrant households generated by the project, M-X-related housing demand would be a function of the incomes, housing (shelter) expenditure potential, and preference patterns of the in-migrant households. Data on assumed average income and shelter expenditure potential are shown in Tables 2.1.1-1 and 2.1.1-2 for five categories of households, with the first table assuming one person employed in each household and the second assuming an additional employed worker earning the average wage obtained in indirect jobs. In the absence of specific data on preferences for housing relative to other goods, it is assumed that the maximum monthly expenditure for shelter is 25 percent of gross income, a figure which has been commonly used as an underwriting criterion by mortgage lenders and by government housing assistance programs. The data show the maximum monthly rent affordable for workers with the average salary ranges from $700 for construction workers to $248 for enlisted military personnel, assuming one-worker households. The corresponding values for two-worker households would be $983 and $531 per month, respectively. The maximum affordable home purchase prices are also shown in the tables, with a maximum price of $73,500 for construction-worker households with one employed person, ranging to a low of about $26,000 for enlisted military personnel. The equivalent values for two-worker households are $103,300 and $55,800, respectively. All of these affordable prices assume mortgage interest rates of 14 percent and downpayments of 20 percent of the purchase price, although equivalent data for other interest rates are shown in the tables. Although the aspect of money demand for housing is not a formal part of the model, these data are used in qualitatively assessing the probable market response to the increment of demand for dwelling units induced by the M-X project.

Although available data about housing preferences, demand, and consumption patterns of construction worker households are very limited, the Construction Worker Profile (Mountain West Research, Inc., December 1975) provides a useful starting point for estimating these types of parameters. Data from the sample survey of residents in five western communities currently affected by large-scale energy and mineral development projects are shown in Table 2.1.1-3. The housing supply matrix described in a subsequent section is partially determined by evaluating incomes, housing expenditure potential, and preference patterns to assess the demand side of the housing market.

2.1.2 Total Housing Unit Requirements

Total M-X-related housing requirements in a given year, and net annual requirements for additional new dwellings, are a function of the number of in-migrant households with an allowance for a "normal" vacancy rate and replacements for units which are removed from the market inventory due to events such as fires

Table 2.1.1-1. M-X-related potential demand for housing by affordable price and rent levels, by employment category, assuming one worker per household.

HOUSEHOLD CATEGORY	AVERAGE ANNUAL INCOME (1980 $)	ANNUAL SHELTER EXPENDITURES AS A PERCENT OF GROSS INCOME	ANNUAL SHELTER EXPENDITURE POTENTIAL	MONTHLY SHELTER EXPENDITURE POTENTIAL	MAXIMUM MONTHLY RENT AFFORDABLE	MAXIMUM HOME PRICE AFFORDABLE BY MORTGAGE INTEREST RATE[1]		
						10 PERCENT	12 PERCENT	14 PERCENT
Construction Workers	$33,600	25	$8,400	$700	$700	$98,983	$84,579	$73,528
Military Households								
Officers	24,200	25	6,050	504	504	71,291	60,917	52,958
Enlisted	11,900	25	2,975	248	248	35,056	29,955	26,041
Civilian Base Employees	14,000	25	3,500	292	292	41,243	35,241	30,636
Indirect Workers	13,600	25	3,400	283	283	40,064	34,235	29,761

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[1]Assumes down payment is 20 percent of purchase price.

Table 2.1.1-2. M-X-related potential demand for housing by affordable price and rent levels, by employment category of primary wage earner, assuming two workers per household.[1]

HOUSEHOLD CATEGORY	AVERAGE ANNUAL INCOME (1980 $)	ANNUAL SHELTER EXPENDITURES AS A PERCENT OF GROSS INCOME	ANNUAL SHELTER EXPENDITURE POTENTIAL	MONTHLY SHELTER EXPENDITURE POTENTIAL	MAXIMUM MONTHLY RENT AFFORDABLE	MAXIMUM HOME PRICE AFFORDABLE BY MORTGAGE INTEREST RATE[2]		
						10 PERCENT	12 PERCENT	14 PERCENT
Construction Workers	$47,200	25	$11,800	$983	$983	$139,047	$118,814	$103,289
Military Households								
Officers	37,800	25	9,450	788	788	111,355	95,152	82,719
Enlisted	25,500	25	6,375	531	531	75,120	64,190	55,802
Civilian Base Employees	27,600	25	6,900	575	575	81,307	69,476	60,397
Indirect Workers	27,200	25	6,800	567	567	80,128	68,471	59,522

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[1]Assumes second wage earner has the average income of indirect workers.

[2]Assumes down payment is 20 percent of purchase price.

Table 2.1.1-3. Housing preference, demand, and consumption patterns of construction workers, other newcomers, and long-time residents in five western communities sampled in the Construction Worker Profile[1] study.

TYPE OF UNIT	NEWCOMER CONSTRUCTION WORKERS			OTHER NEWCOMERS			LONG-TIME RESIDENTS		
	PREFERENCE	EFFECTIVE DEMAND	ACTUAL CONSUMPTION	PREFERENCE	EFFECTIVE DEMAND	ACTUAL CONSUMPTION	PREFERENCE	EFFECTIVE DEMAND	ACTUAL CONSUMPTION
Single-Family	.46	.34	.19	.70	.55	.44	.87	.81	.76
Duplex-Townhouse	.01	.02	.02	04	.04	.05	.01	.01	.01
Apartment	.08	.09	.10	.07	.13	.16	.03	.04	.04
Mobile Home	.38	.46	.53	.17	.25	.32	.09	.13	.18
Other	.08	.10	.16	.01	.02	.03	.01	.01	.01
Total	1.01	1.01	1.00	.99	.99	1.00	1.01	1.00	1.00

[1]Source: Mountain West Research, Inc., December 1975. *Construction Worker Profile Final Report* (Billings MT, Old West Regional Commission), p. 103.

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or demolitions. Housing unit requirements are computed as 1.05 times the increment of increase in the number of households and should be interpreted as the number of units which are required to accommodate all households and allow for relatively frictionless turnover.

2.1.3 Housing Supply Constraints

There are persuasive reasons for expecting that the total number of units required by M-X-related households, or number for which there is effective economic demand, will be only partially supplied in local housing markets by permanent dwellings, at least in the initial years. To replicate this "real world" situation in the model, a housing supply constraints matrix was estimated which indicates for each category of households the proportion of their housing requirements that would likely be met by permanent housing, including single-family and multi-unit dwellings, and by mobile homes. In addition to average household income (or ability to afford the prices and rents of new units) and preference patterns for the various housing types, the estimated distribution among structure types of new housing provided each year would be a function of the capabilities of local housing suppliers to produce new permanent housing. These capabilities are likely to be limited by several factors, including the small size of the local homebuilding industry, insufficient local supply of skilled construction labor, lack of available building sites which have urban services, time lags involved between land acquisition and improvement and actual completion of dwellings, insufficient locally available supply of mortgage capital for both construction and permanent financing, and the probability that local housing markets will be relatively unorganized until market institutions have time to become more fully developed. The likelihood that production constraints would be more severe in the short term and the temporary nature of a sizable portion of housing demand during the construction phase of the M-X project shift larger shares of housing provided in the initial years to the mobile home category. With the passage of time, stabilization of housing demand and improving production capabilities for permanent housing would result in increasing shares of demand being supplied by permanent residential construction.

These effects are represented in the model by varying over time the housing supply constraints matrices which indicate the proportions of housing requirements met by each of the three housing types for each of the seven population categories. The initial matrix, shown on the left side of Table 2.1.3-1, shows that a small share of housing requirements in the first year would be met through production of new permanent housing while large proportions are mobile homes. Base construction workers would be provided a proportionately greater share of permanent housing units initially, due to their much larger purchasing power and effective economic demand, while smaller proportions of lesser-income military and indirect households would obtain permanent housing. Cluster (DDA facility) construction worker households are assumed to demand only mobile homes because of the itinerant nature of their construction activities in remote areas. The matrix on the right shows the long-term housing supply proportions, with much higher shares for single-family and multi-unit housing constructed onsite. Parameters in the long-term matrix are estimated from data for a sample of small western communities which have Air Force bases (U.S. Bureau of the Census, 1978) and from data on housing patterns of construction workers (Construction Worker Profile: Final Report, 1975).

Table 2.1.3-1. Initial and steady-state community housing supply assumptions by housing type, for seven household categories.

HOUSEHOLD CATEGORY	INITIAL HOUSING SUPPLY CONSTRAINTS MATRIX			STABLE, STEADY-STATE HOUSING SUPPLY MATRIX		
	SF	MF	MH	SF	MF	MH
Base Construction	.20	.10	.70	.25	.15	.60
Base A & C.O.	0	0	0	0	0	0
Cluster Construction	0	0	1.00	0	0	1.00
Cluster A & C.O.	0	0	0	0	0	0
Military Operations	.10	.10	.80	.60	.20	.20
Civilian Operations	.10	.10	.80	.60	.20	.20
Indirect	.10	.10	.80	.60	.20	.20

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Source: HDR Sciences.

2.1.4 Change in Housing Supply

The cumulative change in housing supply for a given year is projected by multiplying the numbers of in-migrant households in the seven categories by the appropriate values from the applicable housing supply matrix. The total number of units of a given type is obtained by summing across the household categories and multiplying by 1.05 to include an allowance for vacant units and replacements. The procedure is repeated for each of the three housing types. Annual change in supply of housing units of a given type, which may be positive or negative, is computed as the difference from the previous year in the number of units of a given type. Positive numbers indicate the number of newly constructed permanent housing units or newly delivered mobile homes, while negative signs indicate surpluses of units or removals of mobile homes.

2.2 EXAMPLE HOUSING MODEL OUTPUTS AND INTERPRETATION

Illustrative housing sector model outputs are presented in Tables 2.2-1 through 2.2-4 which show, respectively, the number of inmigrant households by population category, cumulative housing requirements by type of structure, net annual housing production required (or surpluses of units which must be removed), also by type of structure, and total additional housing units required as a result of M-X and other concurrent projects. The following sections describe each summary output table in terms of how should be interpreted and provide the definitional equations for computing the values for the variables. Population input data by employment category and place of residence for the Proposed Action are shown in Appendix A-1 for Beaver County, Utah, site of the second operating base. The appendix also contains the detailed, unsummarized model output for Beaver County for the Proposed Action.

NUMBER OF HOUSEHOLDS (TABLE 2.2-1)

The total numbers of M-X related in-migrant households that would be present in the example county are shown in the table for each year from 1982 through 1994 for each population category. Population categories are defined by the employment type of the primary wage earner in a household. In households with more than one worker, the general rule is that the household is classified by the employment category of the worker holding an M-X direct job. For example, a household which contains two employed persons, one as an M-X construction worker and the other in an indirect job, would be classified in the construction worker population category.

The table also shows the percentage increase in the number of households over the baseline as a result of in-migration of M-X-related households. These data indicate the change generated by M-X-related households present in the example county in a given year relative to the number of baseline households which would be present that year without the M-X project. The data do not identify the relative change from the present time or from a single base year.

The number of baseline households shown in the example table, for instance 3,363 in 1987, are computed as the quotient of baseline population (10,023) and estimated average household size in the county, conservatively assumed to be constant throughout the projection period at the average household size estimated in 1977 (2.98). Average household size in 1977 is estimated separately for each county

Table 2.2-1. Cumulative M-X-related households expected to reside in local communities, by alternative, in Beaver, assuming high baseline (page 1 of 2).

ALTERNATIVE / EXPECTED SOURCE OF NEED	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
BASELINE HOUSEHOLDS	2197	2907		3688	4021	3363	3263	3293	3343	3399	3453	3508	3545
PROPOSED ACTION													
CONSTRUCTION WORKER	0	0	73	652	1202	945	605	292	0	0	0	0	0
MILITARY OPERATIONS	0	0	0	0	165	329	434	665	665	665	665	665	665
CIVILIAN OPERATIONS	0	0	0	0	144	330	555	735	735	734	734	733	733
INDIRECT WORKER	0	0	277	704	1130	1807	1573	1113	526	0	0	0	0
TOTAL M-X RELATED	0	0	350	1356	2639	3410	3324	2804	1926	1399	1399	1398	1398
PERCENT DIFFERENCE FROM BASELINE	0.0	0.0	10.6	36.8	65.6	101.4	102.0	85.1	57.6	41.2	40.5	39.8	39.4
ALTERNATIVE 1													
CONSTRUCTION WORKER	0	0	73	581	720	215	89	25	0	0	0	0	0
MILITARY OPERATIONS	0	0	0	0	46	92	137	185	185	185	185	185	185
CIVILIAN OPERATIONS	0	0	0	0	0	0	3	13	12	12	11	11	10
INDIRECT WORKER	0	0	0	0	0	149	191	157	93	74	72	71	71
TOTAL M-X RELATED	0	0	73	581	767	457	420	379	290	271	268	267	266
PERCENT DIFFERENCE FROM BASELINE	0.0	0.0	2.2	15.7	19.1	13.6	12.9	11.5	8.7	8.0	7.8	7.6	7.5
ALTERNATIVE 2													
CONSTRUCTION WORKER	0	0	73	576	684	160	53	4	0	0	0	0	0
MILITARY OPERATIONS	0	0	0	0	0	0	0	0	0	0	0	0	0
CIVILIAN OPERATIONS	0	0	0	0	0	0	3	13	12	12	11	11	10
INDIRECT WORKER	0	0	0	0	0	0	2	0	0	0	0	0	0
TOTAL M-X RELATED	0	0	73	576	684	160	56	17	12	12	11	11	10
PERCENT DIFFERENCE FROM BASELINE	0.0	0.0	2.2	15.6	17.0	4.8	1.7	0.5	0.4	0.4	0.3	0.3	0.3
ALTERNATIVE 3													
CONSTRUCTION WORKER	15	30	135	631	716	160	53	4	0	0	0	0	0
MILITARY OPERATIONS	0	0	40	81	122	162	202	242	242	242	242	242	242
CIVILIAN OPERATIONS	0	0	0	0	0	7	18	28	27	27	26	26	25
INDIRECT WORKER	20	76	121	34	92	266	291	285	153	114	110	109	109
TOTAL M-X RELATED	35	107	297	745	921	594	561	558	422	382	378	377	376
PERCENT DIFFERENCE FROM BASELINE	1.6	3.7	9.0	20.2	22.9	17.7	17.2	16.9	12.6	11.2	10.9	10.7	10.6
ALTERNATIVE 4													
CONSTRUCTION WORKER	15	30	135	631	716	160	53	4	0	0	0	0	0
MILITARY OPERATIONS	0	0	40	81	122	162	202	242	242	242	242	242	242
CIVILIAN OPERATIONS	0	0	0	0	0	7	18	28	27	27	26	26	25
INDIRECT WORKER	20	76	121	34	92	266	291	285	153	114	110	109	109
TOTAL M-X RELATED	35	107	297	745	921	594	561	558	422	382	378	377	376
PERCENT DIFFERENCE FROM BASELINE	1.6	3.7	9.0	20.2	22.9	17.7	17.2	16.9	12.6	11.2	10.9	10.7	10.6

Table 2.2-1. Cumulative M-X-related households expected to reside in local communities, by alternative, in Beaver, assuming high baseline (page 2 of 2).

ALTERNATIVE 5													
CONSTRUCTION WORKER	424	706	954	1342	1144	160	50	4	0	0	0	0	0
MILITARY OPERATIONS	0	0	144	292	439	583	727	871	871	871	871	871	871
CIVILIAN OPERATIONS	0	0	150	304	459	645	825	1005	1005	1004	1004	1003	1003
INDIRECT WORKER	459	1338	2025	2630	2459	2003	1239	0	0	0	0	0	0
TOTAL M-X RELATED	883	2044	3273	4567	4500	3391	2832	1880	1876	1875	1874	1874	1874
PERCENT DIFFERENCE FROM BASELINE	40.2	70.3	99.2	123.8	111.9	100.8	85.9	57.1	56.1	55.2	54.3	53.4	52.9
ALTERNATIVE 6													
CONSTRUCTION WORKER	424	706	954	1342	1144	160	50	4	0	0	0	0	0
MILITARY OPERATIONS	0	0	144	292	439	583	727	871	871	871	871	871	871
CIVILIAN OPERATIONS	0	0	150	304	459	645	825	1005	1005	1004	1004	1003	1003
INDIRECT WORKER	459	1338	2025	2630	2459	2003	1239	0	0	0	0	0	0
TOTAL M-X RELATED	883	2044	3273	4567	4500	3391	2832	1880	1876	1875	1874	1874	1874
PERCENT DIFFERENCE FROM BASELINE	40.2	70.3	99.2	123.8	111.9	100.8	85.9	57.1	56.1	55.2	54.3	53.4	52.9
ALTERNATIVE 8A													
CONSTRUCTION WORKER	0	0	0	59	354	787	304	0	0	0	0	0	0
MILITARY OPERATIONS	0	0	0	0	0	0	0	0	0	0	0	0	0
CIVILIAN OPERATIONS	0	0	0	0	0	0	0	0	0	0	0	0	0
INDIRECT WORKER	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL M-X RELATED	0	0	0	59	354	787	304	0	0	0	0	0	0
PERCENT DIFFERENCE FROM BASELINE	0.0	0.0	0.0	1.6	8.8	23.4	9.3	0.0	0.0	0.0	0.0	0.0	0.0

SOURCE: MRM SCIENCES, 23-OCT-80

Table 2.2-2. Cumulative M-X-related housing unit requirements in local communities by housing type, by alternative, in Beaver, assuming high baseline (page 1 of 2).

ALTERNATIVE	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
BASELINE REQUIREMENTS													
WITH TREND GROWTH (TG)	1641	1683	1730	1779	1802	1818	1834	1851	1866	1887	1908	1927	1943
WITH OTHER PROJCTS (HG)	2307	3052	3465	3873	4222	3531	3423	3457	3511	3569	3626	3683	3722
% HG ABOVE TG	40 6	81 3	100 3	117 6	134 3	94 2	86 6	86 8	88 1	89 1	90 0	91 1	91 6
PROPOSED ACTION													
M-X HOUSING WITH TG	0	0	404	1469	2835	3626	3532	2987	2060	1484	1484	1484	1484
% ABOVE TG BASELINE	0 0	0 0	23 3	82 5	157 3	199 4	192 5	161 4	110 4	78 6	77 8	77 0	76 4
M-X HOUSING WITH HG	0	0	367	1424	2771	3581	3490	2945	2023	1469	1469	1468	1468
M-X + OTHER PROJECTS	665	1368	2101	3517	5190	5294	5078	4551	3667	3150	3186	3224	3247
% ABOVE TG BASELINE	40 6	81 3	121 5	197 7	288 0	291 1	276 8	245 9	196 5	166 9	166 9	167 3	167 1
ALTERNATIVE 1													
M-X HOUSING WITH TG	0	0	89	626	823	518	484	441	341	322	320	320	319
% ABOVE TG BASELINE	0 0	0 0	5 1	35 2	45 7	28 5	26 4	23 8	18 3	17 1	16 8	16 6	16 4
M-X HOUSING WITH HG	0	0	76	610	805	479	441	398	304	284	281	280	280
M-X + OTHER PROJECTS	665	1368	1810	2703	3224	2192	2029	2004	1948	1965	1998	2036	2039
% ABOVE TG BASELINE	40 6	81 3	104 7	151 9	178 9	120 5	110 6	108 3	104 4	104 1	104 7	105 6	106 0
ALTERNATIVE 2													
M-X HOUSING WITH TG	0	0	89	620	736	187	99	44	28	27	27	27	27
% ABOVE TG BASELINE	0 0	0 0	5 1	34 8	40 8	10 3	5 4	2 4	1 5	1 4	1 4	1 4	1 4
M-X HOUSING WITH HG	0	0	76	605	718	168	57	18	13	12	12	11	11
M-X + OTHER PROJECTS	665	1368	1810	2698	3137	1881	1645	1624	1657	1693	1729	1767	1790
% ABOVE TG BASELINE	40 6	81 3	104 7	151 6	174 1	103 4	89 7	87 8	88 8	89 7	90 6	91 7	92 1
ALTERNATIVE 3													
M-X HOUSING WITH TG	51	141	349	829	1025	669	631	629	480	438	435	435	435
% ABOVE TG BASELINE	3 1	8 4	20 2	46 6	56 9	36 8	34 4	34 0	25 7	23 2	22 8	22 6	22 4
M-X HOUSING WITH HG	37	112	312	783	967	624	589	586	443	401	397	396	395
M-X + OTHER PROJECTS	702	1480	2046	2876	3386	2337	2177	2192	2087	2082	2114	2152	2174
% ABOVE TG BASELINE	42 8	88 0	118 3	161 6	187 9	128 5	118 7	118 4	111 9	110 3	110 8	111 6	111 9
ALTERNATIVE 4													
M-X HOUSING WITH TG	51	141	349	829	1025	669	631	629	480	438	435	435	435
% ABOVE TG BASELINE	3 1	8 4	20 2	46 6	56 9	36 8	34 4	34 0	25 7	23 2	22 8	22 6	22 4
M-X HOUSING WITH HG	37	112	312	783	967	624	589	586	443	401	397	396	395
M-X + OTHER PROJECTS	702	1480	2046	2876	3386	2337	2177	2192	2087	2082	2114	2152	2174
% ABOVE TG BASELINE	42 8	88 0	118 3	161 6	187 9	128 5	118 7	118 4	111 9	110 3	110 8	111 6	111 9

Table 2.2-2. Cumulative M-X-related housing unit requirements in local communities by housing type, by alternative, in Beaver, assuming high baseline (page 2 of 2).

ALTERNATIVE 5													
M-X HOUSING WITH TG	941	2175	3483	4851	4789	3605	3016	2001	1984	1984	1984	1984	1984
% ABOVE TG BASELINE	57 3	129 2	201 3	272 6	265 7	198 2	164 4	108 1	106 3	105 1	103 9	102 9	102 1
M-X HOUSING WITH HG	927	2146	3436	4795	4725	3560	2974	1974	1969	1969	1968	1968	1967
M-X + OTHER PROJECTS	1392	3514	5170	6888	7144	5273	4562	3980	3613	3650	3685	3724	3746
% ABOVE TG BASELINE	97 1	208 8	298 8	387 1	396 4	290 0	248 7	193 4	193 6	193 4	193 1	193 2	192 8
ALTERNATIVE 6													
M-X HOUSING WITH TG	941	2175	3483	4851	4789	3605	3016	2001	1984	1984	1984	1984	1984
% ABOVE TG BASELINE	57 3	129 2	201 3	272 6	265 7	198 2	164 4	108 1	106 3	105 1	103 9	102 9	102 1
M-X HOUSING WITH HG	927	2146	3436	4795	4725	3560	2974	1974	1969	1969	1968	1968	1967
M-X + OTHER PROJECTS	1392	3514	5170	6888	7144	5273	4562	3980	3613	3650	3685	3724	3746
% ABOVE TG BASELINE	97 1	208 8	298 8	387 1	396 4	290 0	248 7	193 4	193 6	193 4	193 1	193 2	192 8
ALTERNATIVE 8A													
M-X HOUSING WITH TG	0	0	0	77	390	840	331	0	0	0	0	0	0
% ABOVE TG BASELINE	0 0	0 0	0 0	4 3	21 6	46 2	18 0	0 0	0 0	0 0	0 0	0 0	0 0
M-X HOUSING WITH HG	0	0	0	62	372	827	319	0	0	0	0	0	0
M-X + OTHER PROJECTS	665	1368	1734	2155	2791	2540	1907	1606	1644	1681	1717	1756	1779
% ABOVE TG BASELINE	40 6	81 3	100 3	121 1	154 9	139 7	104 0	86 8	88 1	89 1	90 0	91 1	91 6

SOURCE HDR SCIENCES, 1-NOV-80

Table 2.2-3. Net annual M-X-related housing unit requirements in local communities by housing type, by alternative, in Beaver, assuming high baseline (page 1 of 2).

ALTERNATIVE / HOUSING TYPE	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
BASELINE REQUIREMENTS	2307	745	412	408	340	690	-108	34	53	58	56	57	39
PROPOSED ACTION													
SINGLE FAMILY UNITS	0	0	29	64	223	342	76	142	7	75	73	0	0
MULTI-FAMILY UNITS	0	0	29	56	145	149	46	13	-33	-111	0	0	0
MOBILE HOMES	0	0	309	936	980	318	211	-701	-895	-369	-73	0	0
TOTAL M-X RELATED	0	0	367	1057	1347	810	-91	-545	-922	554	0	1	0
M-X PLUS BASELINE	2307	745	779	1465	1695	119	-199	-510	868	-495	56	56	39
ALTERNATIVE 1													
SINGLE FAMILY UNITS	0	0	0	1	18	42	21	34	16	20	17	-1	0
MULTI-FAMILY UNITS	0	0	0	1	9	23	14	10	4	-4	-1	0	0
MOBILE HOMES	0	0	76	532	168	-891	-73	88	-113	-36	-19	0	0
TOTAL M-X RELATED	0	0	76	534	195	-826	-38	-43	-94	-20	-3	-1	0
M-X PLUS BASELINE	2307	745	488	942	543	-1016	-146	-8	-40	38	53	56	39
ALTERNATIVE 2													
SINGLE FAMILY UNITS	0	0	0	0	0	0	0	0	0	0	0	0	0
MULTI-FAMILY UNITS	0	0	0	0	0	0	0	0	0	0	0	0	0
MOBILE HOMES	0	0	76	529	113	-550	-111	-39	-5	-1	0	-1	0
TOTAL M-X RELATED	0	0	76	529	113	-550	-111	-39	-5	-1	0	-1	0
M-X PLUS BASELINE	2307	745	488	937	461	-1240	-219	-4	48	57	56	56	39
ALTERNATIVE 3													
SINGLE FAMILY UNITS	0	0	0	0	0	0	0	0	0	0	0	0	0
MULTI-FAMILY UNITS	0	0	0	0	0	0	0	0	0	0	0	0	0
MOBILE HOMES	37	75	200	471	184	-343	-35	-3	-143	-42	-4	1	-1
TOTAL M-X RELATED	37	75	200	471	184	-343	-35	-3	-143	42	4	1	-1
M-X PLUS BASELINE	2344	820	612	879	532	1033	-143	31	-89	16	52	56	38
ALTERNATIVE 4													
SINGLE FAMILY UNITS	0	0	0	0	0	0	0	0	0	0	0	0	0
MULTI-FAMILY UNITS	0	0	0	0	0	0	0	0	0	0	0	0	0
MOBILE HOMES	37	75	200	471	184	-343	-35	-3	-143	-42	-4	-1	-1
TOTAL M-X RELATED	37	75	200	471	184	-343	-35	-3	-143	-42	-4	-1	-1
M-X PLUS BASELINE	2344	820	612	879	532	-1033	-143	31	-89	16	52	56	38

Table 2.2-3. Net annual M-X-related housing unit requirements in local communities by housing type, by alternative, in Beaver, assuming high baseline (page 2 of 2).

ALTERNATIVE 5													
SINGLE FAMILY UNITS	137	189	174	267	20	190	273	-167	99	-1	0	0	-1
MULTI-FAMILY UNITS	93	159	127	78	13	39	75	-190	0	0	0	0	-1
MOBILE HOMES	697	872	989	1013	-104	-1393	-935	-642	-103	0	0	0	-1
TOTAL M-X RELATED	927	1219	1290	1359	-70	-1165	-586	-1000	-5	0	-1	0	-1
M-X PLUS BASELINE	3234	1964	1702	1767	278	-1855	-694	-965	48	58	55	57	38
ALTERNATIVE 6													
SINGLE FAMILY UNITS	137	189	174	267	20	190	273	-167	99	-1	0	0	-1
MULTI-FAMILY UNITS	93	159	127	78	13	39	75	-190	0	0	0	0	-1
MOBILE HOMES	697	872	989	1013	-104	-1393	-935	-642	-103	0	0	0	-1
TOTAL M-X RELATED	927	1219	1290	1359	-70	-1165	-586	-1000	-5	0	-1	0	-1
M-X PLUS BASELINE	3234	1964	1702	1767	278	-1855	-694	-965	48	58	55	57	38
ALTERNATIVE 8A													
SINGLE FAMILY UNITS	0	0	0	0	0	0	0	0	0	0	0	0	0
MULTI-FAMILY UNITS	0	0	0	0	0	0	0	0	0	0	0	0	0
MOBILE HOMES	0	0	0	62	310	455	508	-319	0	0	0	0	0
TOTAL M-X RELATED	0	0	0	62	310	455	-508	-319	0	0	0	0	0
M-X PLUS BASELINE	2307	745	412	470	658	-235	-616	-284	53	58	56	57	39

SOURCE: HDR SCIENCES, 1-NOV-80

Table 2.2-4. Cumulative baseline housing unit requirements in local communities, and cumulative total housing unit requirements related to M-X and other projects, by alternative, in Beaver (page 1 of 2).

ALTERNATIVE / HOUSING TYPE	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
BASELINE REQUIREMENTS	2307	3052	3465	3873	4222	3531	3423	3457	3511	3569	3626	3683	3722
PROPOSED ACTION													
SINGLE FAMILY UNITS	0	0	29	93	316	658	734	876	883	808	881	881	881
MULTI-FAMILY UNITS	0	0	29	85	230	379	425	438	405	294	294	294	294
MOBILE HOMES	0	0	309	1245	2225	2543	2332	1631	736	367	294	294	294
TOTAL M-X RELATED	0	0	367	1424	2771	3581	3490	2945	2023	1469	1469	1468	1468
M-X PLUS BASELINE	2307	3052	3832	5297	6993	7112	6913	6402	5534	5038	5095	5151	5190
ALTERNATIVE 1													
SINGLE FAMILY UNITS	0	0	0	1	19	61	82	116	132	152	169	168	168
MULTI-FAMILY UNITS	0	0	0	1	10	33	47	57	61	57	56	56	56
MOBILE HOMES	0	0	76	608	776	385	312	224	111	75	56	56	56
TOTAL M-X RELATED	0	0	76	610	805	479	441	398	304	284	281	280	280
M-X PLUS BASELINE	2307	3052	3541	4483	5027	4010	3864	3855	3815	3853	3907	3963	4002
ALTERNATIVE 2													
SINGLE FAMILY UNITS	0	0	0	0	0	0	0	0	0	0	0	0	0
MULTI-FAMILY UNITS	0	0	0	0	0	0	0	0	0	0	0	0	0
MOBILE HOMES	0	0	76	605	718	168	57	18	13	12	12	11	11
TOTAL M-X RELATED	0	0	76	605	718	168	57	18	13	12	12	11	11
M-X PLUS BASELINE	2307	3052	3541	4478	4940	3699	3480	3475	3524	3581	3638	3694	3733
ALTERNATIVE 3													
SINGLE FAMILY UNITS	0	0	0	0	0	0	0	0	0	0	0	0	0
MULTI-FAMILY UNITS	0	0	0	0	0	0	0	0	0	0	0	0	0
MOBILE HOMES	37	112	312	783	967	624	589	586	443	401	397	396	395
TOTAL M-X RELATED	37	112	312	783	967	624	589	586	443	401	397	396	395
M-X PLUS BASELINE	2344	3164	3777	4656	5189	4155	4012	4043	3954	3970	4023	4079	4117
ALTERNATIVE 4													
SINGLE FAMILY UNITS	0	0	0	0	0	0	0	0	0	0	0	0	0
MULTI-FAMILY UNITS	0	0	0	0	0	0	0	0	0	0	0	0	0
MOBILE HOMES	37	112	312	783	967	624	589	586	443	401	397	396	395
TOTAL M-X RELATED	37	112	312	783	967	624	589	586	443	401	397	396	395
M-X PLUS BASELINE	2344	3164	3777	4656	5189	4155	4012	4043	3954	3970	4023	4079	4117

Table 2.2-4. Cumulative baseline housing unit requirements in local communities, and cumulative total housing unit requirements related to M-X and other projects, by alternative, in Beaver (page 2 of 2).

ALTERNATIVE 5													
SINGLE FAMILY UNITS	137	326	500	767	787	977	1250	1083	1182	1181	1181	1181	1180
MULTI-FAMILY UNITS	93	252	379	457	470	509	584	394	394	394	394	394	393
MOBILE HOMES	697	1569	2558	3571	3467	2074	1139	497	394	394	394	394	393
TOTAL M-X RELATED	927	2146	3436	4795	4725	3560	2974	1974	1969	1969	1968	1968	1967
M-X PLUS BASELINE	3234	5198	6901	8668	8947	7091	6397	5431	5480	5538	5594	5651	5689
ALTERNATIVE 6													
SINGLE FAMILY UNITS	137	326	500	767	787	977	1250	1083	1182	1181	1181	1181	1180
MULTI-FAMILY UNITS	93	252	379	457	470	509	584	394	394	394	394	394	393
MOBILE HOMES	697	1569	2558	3571	3467	2074	1139	497	394	394	394	394	393
TOTAL M-X RELATED	927	2146	3436	4795	4725	3560	2974	1974	1969	1969	1968	1968	1967
M-X PLUS BASELINE	3234	5198	6901	8668	8947	7091	6397	5431	5480	5538	5594	5651	5689
ALTERNATIVE 8A													
SINGLE FAMILY UNITS	0	0	0	0	0	0	0	0	0	0	0	0	0
MULTI-FAMILY UNITS	0	0	0	0	0	0	0	0	0	0	0	0	0
MOBILE HOMES	0	0	0	62	372	827	319	0	0	0	0	0	0
TOTAL M-X RELATED	0	0	0	62	372	827	319	0	0	0	0	0	0
M-X PLUS BASELINE	2307	3052	3465	3935	4594	4358	3742	3457	3511	3569	3626	3683	3722

SOURCE: HDR SCIENCES, 1-NOV-80

in the two potential deployment regions by adjusting the 1970 household size to change at the same rate since 1970 as that estimated by the Bureau of the Census at the state level. These data are shown in Appendix Table A-2.

Computational Equations

(1)
$$H_T^t = \sum_{i=1}^{n} \frac{P_i^t}{A_i} = \sum_{i=1}^{n} H_i$$

H_T^t = Total number of Households present in year t

where P_i^t = Population in the ith population category resident in communities in year t

A_i = Average household size for the ith population category

H_i = Number of households in the ith population category and

t = Year or time period

n = Number of population categories = 7

In the example summary table, four population categories are distiniguished and the equation become:

(2)
$$H_T^t = \frac{P_c^t}{A_c} + \frac{P_m^t}{A_m} + \frac{P_o^t}{A_o} + \frac{P_d^t}{A_d}$$

where P_c^t = Population in construction worker category resident in communities in year t

A_c = Average household size for construction worker families = 3.5

P_m^t = Population in military personnel category resident in communities in year t

A_m = Average household size for military families = 3.3

P_o^t = Population in civilian operations category resident in communities in year t

A_o = Averge household size for civlian operations households = 2.8

P_d^t = Population in indirect employment category resident in communities in year t

and A_d = Average household size for indirect worker households = 2.8

CUMULATIVE HOUSING UNIT REQUIREMENTS (TABLE 2.2-2)

The cumulative numbers of housing units required by M-X-related in-migrant households are shown in the table year-by-year from 1982 through 1994 for each of the types of residential structures. Housing types include two categories of permanent housing, single-unit and multi-unit structures and mobile homes. The data, which are for housing required in communities, are shown for each alternative which affects a county and excludes family and group housing provided on the operating base by the Air Force and group housing in temporary camps to accommodate construction workers neasr DDA facility sites in remote areas.

Computational Equations

(3) $U_T^t = U_s^t + U_r^t + U_m^t$

where U_T^t = Total housing units required in communities in year t

U_s^t = Number of single-family units required in year t

U_r^t = Number of units in multi-unit structures required in year t

and U_m^t = Number of mobile homes required in year t

The general equation for the number of units of a given type is:

(4) $U_a^t = 1.05 \sum_{i=1}^{n} H_i^t \; S_{ai}^t$

where U_a^t = Number of units of type a required in year t

H_i^t = Number of households in the i^{th} population category in year t

S_{ai}^t = Proportion of demand by households in category i met by structure type a in year t

1.05 = Constant vacancy factor

n = Number of population categories

For single-family units:

(5) $U_s^t = 1.05 \; H_c^t S_{sc}^t + H_f^t S_{sf}^t + H_o^t S_{so}^t + H_d^t S_{sd}^t$

where U_s^t = Number of single family units required in year t

H_c^t = Number of construction worker households present in local communities in year t

S_{sc}^{t} = Proportion of demand by construction worker households met by single-family structures in year t

H_{f}^{t} = Number of military households present in communities in year t

S_{sf}^{t} = Proportion of demand by military households met by single-family structures in year t

H_{o}^{t} = Number of civilian operations worker households present in year t

S_{so}^{t} = Proportion of demand by civilian operations households met by single-family structures in year t

H_{d}^{t} = Number of indirect worker households present in year t

and S_{sd}^{t} = Proportion of demand by indirect households met by single unit structures in year t

Similarly, for required housing units in multi-unit structures:

$$(6) \qquad U_{r}^{t} = 1.05 \left[H_{c}^{t} S_{rc}^{t} + H_{f}^{t} S_{rf}^{t} + H_{o}^{t} S_{ro}^{t} + H_{d}^{t} S_{rd}^{t} \right]$$

and for mobile homes:

$$(7) \qquad U_{m}^{t} = 1.05 \left[H_{c}^{t} S_{mc}^{t} + H_{f}^{t} S_{mf}^{t} + H_{o}^{t} S_{mo}^{t} + H_{d}^{t} S_{md}^{t} \right]$$

NET ANNUAL HOUSING UNITS REQUIRED (TABLE 2.2-3)

This table indicates the number of additional dwelling units that must be provided or the number of surplus units that must be removed in a particular year. For permanent housing, single-family and multi-unit residences, a positive sign indicates the number of additional dwellings that would have to be constructed by the private homebuidling industry during that year, while a negative sign indicates a surplus of units in a particular year. A positive sign for mobile homes denotes the number of additional mobile homes that would have to be delivered and for which sites would have to be prepared in a particular year, while a negative sign represents the number of surplus mobile homes that could be removed during the year. For each structure type the data are obtained by computing the difference between the cumulative number of units requried in the year and the cumulative number required in the previous year. For example, the number of additional single-family units required in 1987, 342 houses, is obtained by subtracting 316 from 658. The data in the table should be interpreted as conditional forecasts of changes in housing supply.

CUMULATIVE NUMBER OF HOUSING UNITS REQUIRED BY M-X AND OTHER CONCURRENT PROJECTS (TABLE 2.2-4)

The number of housing units required by the trend-growth baseline population, the number required by the baseline population assuming other large-scale projects in the county, and the percent increase over the requirements of the trend-growth population are shown in the section of the table labeled baseline requirements. The needs for additional housing units induced by large-scale projects other than M-X can be computed by subtracting the trend-growth from the high growth baseline requirements.

For the Proposed Action and each alternative affecting the county, M-X-related total requirements for housing units are shown for both the trend-growth and high-growth baselines. Housing needs induced by the M-X project are slightly lower for the high-growth baseline due to lower M-X-related labor force and population in-migration. The present change above the trend-growth baseline is presented for both net additional M-X-related housing requirements and for housing needs operated by M-X and other concurrent large-scale projects.

3.0 COMMUNITY LAND USE AND INFRASTRUCTURE MODEL GROUP

3.1 MODEL STRUCTURE AND DESCRIPTION

This sub-model provides quantitative projections of the quantity of land that must be converted to various urban uses such as housing, retail trade, commercial-office, industrial, streets and highways, and public-institutional, in order to accommodate the M-X related growth in population. The model in essence forecasts short-term demand for land by the various urban use activities rather than changes in the supply of land in the use categories. Changes in the actual supply or quantity of land devoted to the urban uses would be a function of the economic value of land in the uses, actual market prices of land, the expected duration of the demand, and the physical characteristics or constraints of the available supply of developable land, as well as numerous policy considerations. Local, state, and even federal policies, including zoning and decisions about capital investments in infrastructure such as water and sewer facilities, are likely to exert a major influence on the location and timing as well as the quantity of land converted to the various urban uses. Requirements for infrastructure related to land development, such as streets and highways and utilities, are projected as a function of land use changes. Various intermediate outputs, including volume of retail sales and capital costs of infrastructure, are available for analysis or as inputs to other sub-models. The computational methods and assumptions, which are different for each category of land use, are described in the following sections.

3.1.1 Residential Land Use

Requirements for additional land for residential use are projected for three density categories corresponding to the three housing types--single-family and multi-unit permanent housing and mobile homes. The total requirement for residential land in a given year is computed as the sum of the products of the number of housing units and corresponding density factors for the three housing types. These density factors are assumed to be three units per acre for single-family permanent housing, ten units per acre for multi-unit permanent housing, and five units per acre for mobile homes (Murphy/Williams, 1978). Total residential construction costs, excluding land, for permanent single-family and multi-unit housing are computed as a function of the numbers of each type of unit required, average size for each type of unit (assumed to be 1,200 and 900 sq ft, respectively, for single-family and multi-unit housing), and the construction costs per sq ft for each structure type. These are estimated as $30 and $25, respectively, based on conversations with local developers.

3.1.2 Retail Land Use

Retail use includes land devoted to retail sales of food, apparel and appliances, general merchandise, drug stores, furniture, hardware, eating and drinking establishments, auto dealers, gas stations, and miscellaneous retail goods. Retail trade land requirements generated by the M-X project are a function of the volume of local retail expenditures by M-X-related population and the quantity of building space necessary to accommodate that sales volume. All categories of M-X-related population would generate retail expenditures locally. The model incorporates distinctions among population categories in both the quantity of retail expenditures, which is a function of income, and the proportion of retail purchases that are local

(in communities of the county or other region being examined) rather than outside the region where impacts are being projected. It is assumed that a much higher share (75 percent) of retail purchases would be local for population groups residing in communities, whereas the share would be lower (25 percent) for those living in construction camps. These latter workers would be either single or present without their families so that a major share of their retail expenditures is likely to occur near the location of their families rather than near M-X construction sites. Similarily, military personnel are assumed to purchase a large share of their retail goods onbase, because of the favorable price and tax treatment, rather than in the local community. The proportion of retail purchases made in local communities varies for military personnel, depending on whether they live on or off base, with a somewhat higher local share for those who live in the community rather than onbase. The proportion of retail expenditures that are estimated to be in local communities is presented in Table 3.1.2-1.

The computational steps used in projecting land requirements for retail trade may be summarized as follows:

1. Aggregate disposable personal income is computed for each employment-related population category. This variable is an output of the economic model.

2. The total volume of expenditures for retail goods is computed by multiplying disposable income by the proportion of income spent on retail goods, which is assumed to be 31 percent (obtained from consumer price index weights used by the U.S. Department of Commerce) for all employment categories.

3. That portion of retail expenditures which is local is computed for each population category and summed to obtain total local retail sales.

4. The dollar volume of retail sales is converted into building space needed to provide such a sales volume. The parameter applied is one of average sales volume per sq ft of gross leasable area. The value of this parameter is estimated to be $87 per sq ft (1978 dollars), based on data for neighborhood and community size shopping centers in the western United States (Urban Land Institute, 1978a).

5. Land requirements are determined as a function of the building space needed, with a factor of four applied. The space not covered by buildings is to accommodate parking, landscaping, and ancillary activities (Urban Land Institute 1978b).

6. The procedure is repeated for each geographical location of employment (base, construction camps, and communities) and is subsequently summed to obtain total retail trade land requirements.

7. Construction costs for retail building are assumed to be $30 per sq ft (1978 dollars), based on conversations with local builders.

Table 3.1.2-1. Estimated proportions of retail expenditures spent locally, by employment category and place of residence.

EMPLOYMENT CATEGORY	PLACE OF RESIDENCE		
	COMMUNITY	BASE	CAMP
Construction - Base	.75	.25	0
Construction - Shelter	.75	.25	.20
Assembly & Check-out - Base	.25	.25	0
Assembly & Check-out - Shelter	.20	.25	.20
Operation - Military	.30	.20	0
Operation - Civilian	.75	0	0
Indirect Workers	.75	0	0

1201-1

3.1.3 Office and Commercial Land Uses

Office and commercial land use is a broad category which encompasses personal and business services, transient housing (hotels and motels), wholesale trade, amusement and recreation services, repair services, and other miscellaneous services. The procedure used to project land required for these uses is identical to that used for retail trade except for the following modifications in assumptions: (1) the percent of disposable income spent on services, which by definition are obtained in commercial and office buildings, is 20 percent (estimated from consumer price index weights used by the U.S. Department of Commerce, 1979); (2) each square foot of gross building area would generate $60 of service transactions (in 1978 dollars); (3) ancillary land requirements are 2.5 times the area devoted to buildings; (Murphy/Williams, 1978); and (4) average construction costs are $35 per square foot (estimated based on conversations with local builders in 1978 dollars).

3.1.4 Industrial Land Use

Industrial land use requirements are calculated in a series of five steps: (1) the number of industrial employees is estimated to be 20 percent of total community employment, (2) each industrial employee is assumed to require 550 sq ft of building space, (3) each industrial employee consumes 260 sq ft of parking space, (4) each employee requires 0.2 times the building and parking space devoted to ancillary uses, and (5) land consumption calculated in Steps 2, 3, and 4, above are summed to obtained total land area needed (Murphy/Williams, 1978). Construction costs for industrial buildings are estimated to average $25 per sq ft (in 1978 dollars), based on conversations with builders in the area.

3.1.5 Streets and Highways

This sub-model projects the length of streets required for three categories of streets and the quantity of land required to accommodate community streets and highways. In the model, street requirements are a function of residential and non-residential land development, with varying requirements for each type of housing. The computational steps (Murphy/Williams, 1978) are as follows:

1. Lengths of three types of streets, arterials, collectors, and minor streets are computed for three types of housing units--single-family, multi-unit housing, and mobile homes--by multiplying the number of each type of unit by the required linear feet per unit for each street type. These factors are shown in Table 3.1.5-1.

2. Total residentially-related requirements for each street category are the sum of the requirements for single-family, multi-unit, and mobile home housing types.

3. Non-residential street requirements are a function of residential streets, with a factor of 1.76 for arterials and 1.1 for collectors and minor local streets.

4. Total street length required for each of the three street types is the sum of the residential and non-residential requirements.

Table 3.1.5-1. Estimated linear feet of streets per housing unit for three street categories, by type of housing unit.

TYPE OF HOUSING UNIT	STREET TYPE		
	ARTERIAL	COLLECTOR	MINOR
Single-Family	6.0	7.00	47.0
Multi-Unit	5.0	13.50	10.0
Mobile Homes	5.5	17.25	22.0

1202-1

Source: Murphy/Williams, *Socioeconomic Impact Assessment: A Methodology Applied to Synthetic Fuels* (U.S. Department of Energy, 1978).

5. Land area required to accommodate streets and highways is computed by multiplying street length required for each street type by the right-of-way width (100, 60, and 50 feet, respectively) and by dividing this product by appropriate conversion factors to convert the area to acres and hectares.

6. Street construction costs are computed by multiplying each street length by estimated construction cost per foot, $55, $40, and $35 (1978 dollars), respectively, for each street type. Construction costs are based upon conversations with contractors in the area.

3.1.6 Public and Institutional Land Uses

Land requirements for three types of public facilities other than streets are projected, including schools, parks, and solid waste disposal sites. School land needed is projected by multiplying the number of pupils by a land requirement per pupil, assumed to be .04 acres per pupil (Utah State Office of Education, 1980). Land requirements are computed separately for three grade levels--K-6, 7-9, 10-12--and summed to obtain total requirements. Land requirements are projected for three types of local parks--playgrounds, neighborhood parks, and community parks--by multiplying the population residing in local communities times per capita factors for each park type. These parameters, which are the National Park and Recreation Association's standards for urban communities, are 0.001 acres per person for playgrounds, 0.0013 acres per person for neighborhood parks, and 0.004 acres per person for community parks and open space. It is likely these standards overestimate needs for developed community parkland in the study areas because of their rural character and the abundance of open countryside and dispersed recreation opportunities. For solid waste disposal it is assumed that each person residing in local communities generates a need for 0.000015 acres per year for landfill, assuming that wastes are accumulated to a depth of 10 feet (Architects/Planners Alliance, Inc., 1979).

3.1.7 Public and Private Utilities

This sub-model projects the costs of utility infrastructure associated with residential and non-residential development as well as system-wide and total utility costs. The costs of providing sanitary sewers, water distribution, and electricity to new residential development is a function of the number of housing units, with separate factors for each type of dwelling--single-family, multi-unit, and mobile home--as shown in Table 3.1.7-1. Total residential-related utility development costs for each utility are computed by multiplying the appropriate cost factor per unit times the number of housing units of each type and summing across housing types.

Non-residential utility costs are assumed to be a constant proportion of residential utility costs, with factors of 0.40 for sanitary sewage and 0.20 for water and electricity. System-wide development costs, such as for trunk sewers, wastewater treatment facilities, and water storage facilities, are computed as a constant proportion of the sum of residential and non-residential utility costs. The proportions are 0.40 for sanitary sewage and water, and 0.30 for electricity (Murphy/Williams, 1978). Utility development costs are an intermediate output which provide input data for the public finance and economic models.

Table 3.1.7-1. Estimated utility costs per housing unit for three types of housing.

HOUSING UNIT TYPE	UTILITY COSTS PER UNIT		
	SANITARY SEWERAGE	WATER	GAS & ELECTRIC
Single Family	$1,000	$650	$800
Multiple Family	400	260	320
Mobile Homes	600	390	384

1203-1

Source: HDR Sciences, based on conversations with local contractors.

3.1.8 Indirect Capital Costs

The purpose of this sub-routine is to compute total indirect capital costs by summing construction costs for public and private facilities estimated by other sub-models, including housing, retail and office buildings, industrial buildings, public and institutional buildings, streets and highways, and utilities. All of these capital costs form a feedback loop to the RIMS and econometric models where the "multiplier" effects of these expenditures are used to compute additional earnings and indirect employment. That portion of indirect capital costs which is borne by local government becomes an input to the fiscal impact analysis in the local government sector sub-model. For a more detailed description of assumptions and computational methods for public capital costs, the reader should refer to the separate technical report on the public finance models.

3.2 *EXAMPLE LAND USE MODEL OUTPUTS AND COMPUTATION PROCEDURES*

Illustrative community land use outputs are presented in Tables 3.2-1 and 3.2-2 which indicate cumulative and net annual change in requirements, in acres, for five categories of urban land. These categories are: (1) permanent homes, including single-family and multi-unit residential land uses; (2) mobile home residential land use; (3) retail, commercial, and industrial land uses; (4) streets and highways; and (5) public and institutional land uses. Unsummarized model output, shown in Appendix A-1 for the Proposed Action in Beaver County, Utah, provides considerably more detail in terms of land use categories.

The cumulative data in Table 3.2-1 represent the total M-X-related requirements for additional land in the various urban uses that exist in each year from 1982 through 1994, while the annual data show the quantities of land that would need to be converted to or from the use category during a particular year. Positive signs (for the data in Table 3.2-2) represent requirements for land to be converted to a particular use and negative signs mean that a surplus of land in a use exists which could potentially be converted back to nonurban use. Requirements for additional land in the peak year by the various urban use activities greatly exceed the long-term or permanent requirements. It is likely that a major share of the short-lived requirements during the peak construction period would be met by temporary facilities such as mobile homes and unpaved streets, with the land used for these short-term facilities reverting back to nonurban use after the contruction-related population migrates out of an area upon completion of construction activities.

Table 3.2-1. Cumulative M-X-related land requirements (acres) by use category, by alternative in Beaver, assuming high baseline (page 1 of 2).

ALTERNATIVE / LAND USE CATEGORY	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
PROPOSED ACTION													
PERMANENT HOMES	0	0	13	40	128	257	287	336	334	298	323	323	323
MOBILE HOMES	0	0	62	249	445	509	466	326	147	73	59	59	59
SUBTOTAL	0	0	75	289	573	766	753	662	481	371	382	382	382
RETAIL/COMM /INDUS	0	0	5	25	48	56	56	51	38	29	27	27	27
STS AND HWYS	0	0	51	195	382	500	486	416	292	217	219	219	219
PUBLIC/INSTITUTIONAL	0	0	16	74	146	172	163	136	91	70	70	70	70
TOTAL	0	0	146	583	1149	1494	1458	1265	903	688	698	698	698
ALTERNATIVE 1													
PERMANENT HOMES	0	0	0	0	7	23	32	45	50	57	62	62	62
MOBILE HOMES	0	0	15	122	155	77	62	45	22	15	11	11	11
SUBTOTAL	0	0	15	122	162	100	94	90	72	72	73	73	73
RETAIL/COMM /INDUS	0	0	2	14	18	9	7	6	3	3	3	3	3
STS AND HWYS	0	0	11	84	112	66	62	57	45	43	41	41	41
PUBLIC/INSTITUTIONAL	0	0	5	41	54	26	22	20	16	14	14	14	14
TOTAL	0	0	33	261	346	202	186	172	136	131	131	131	131
ALTERNATIVE 2													
PERMANENT HOMES	0	0	0	0	0	0	0	0	0	0	0	0	0
MOBILE HOMES	0	0	15	121	144	34	11	4	3	2	2	2	2
SUBTOTAL	0	0	15	121	144	34	11	4	3	2	2	2	2
RETAIL/COMM /INDUS	0	0	2	12	15	5	3	2	0	0	0	0	0
STS AND HWYS	0	0	11	83	99	23	7	0	0	0	0	0	0
PUBLIC/INSTITUTIONAL	0	0	5	41	48	12	4	0	0	0	0	0	0
TOTAL	0	0	33	257	306	74	25	6	3	2	2	2	2
ALTERNATIVE 3													
PERMANENT HOMES	0	0	0	0	0	0	0	0	0	0	0	0	0
MOBILE HOMES	7	22	62	157	193	125	118	117	89	80	79	79	79
SUBTOTAL	7	22	62	157	193	125	118	117	89	80	79	79	79
RETAIL/COMM /INDUS	2	3	7	18	21	10	7	6	5	4	4	4	4
STS AND HWYS	5	15	43	108	132	86	80	80	62	55	54	54	54
PUBLIC/INSTITUTIONAL	1	4	17	50	61	31	28	28	22	21	21	21	21
TOTAL	15	44	129	333	407	252	233	231	178	160	158	158	158
ALTERNATIVE 4													
PERMANENT HOMES	0	0	0	0	0	0	0	0	0	0	0	0	0
MOBILE HOMES	7	22	62	157	193	125	118	117	89	80	79	79	79
SUBTOTAL	7	22	62	157	193	125	118	117	89	80	79	79	79
RETAIL/COMM /INDUS	2	3	7	18	21	10	7	6	5	4	4	4	4
STS AND HWYS	5	15	43	108	132	86	80	80	62	55	54	54	54
PUBLIC/INSTITUTIONAL	1	4	17	50	61	31	28	28	22	21	21	21	21
TOTAL	15	44	129	333	407	252	233	231	178	160	158	158	158

Table 3.2-1. Cumulative M-X-related land requirements (acres) by use category, by alternative in Beaver, assuming high baseline (page 2 of 2).

ALTERNATIVE 5													
PERMANENT HOMES	55	134	205	302	309	377	475	400	433	433	433	433	432
MOBILE HOMES	139	314	512	714	693	415	228	99	79	79	79	79	79
SUBTOTAL	194	448	717	1016	1002	792	703	499	512	512	512	512	511
RETAIL/COMM /INDUS	15	32	55	83	90	70	66	58	36	35	35	35	35
STS AND HWYS	130	296	475	668	658	501	426	293	294	294	294	294	294
PUBLIC/INSTITUTIONAL	49	103	165	231	226	155	131	94	93	93	93	93	93
TOTAL	388	878	1411	1998	1977	1517	1326	945	935	934	934	934	934
ALTERNATIVE 6													
PERMANENT HOMES	55	134	205	302	309	377	475	400	433	433	433	433	432
MOBILE HOMES	139	314	512	714	693	415	228	99	79	79	79	79	79
SUBTOTAL	194	448	717	1016	1002	792	703	499	512	512	512	512	511
RETAIL/COMM /INDUS	15	32	55	83	90	70	66	58	36	35	35	35	35
STS AND HWYS	130	296	475	668	658	501	426	293	294	294	294	294	294
PUBLIC/INSTITUTIONAL	49	103	165	231	226	155	131	94	93	93	93	93	93
TOTAL	388	878	1411	1998	1977	1517	1326	945	935	934	934	934	934
ALTERNATIVE 8A													
PERMANENT HOMES	0	0	0	0	0	0	0	0	0	0	0	0	0
MOBILE HOMES	0	0	0	12	74	165	64	0	0	0	0	0	0
SUBTOTAL	0	0	0	12	74	165	64	0	0	0	0	0	0
RETAIL/COMM /INDUS	0	0	0	2	10	18	7	0	0	0	0	0	0
STS AND HWYS	0	0	0	9	51	114	44	0	0	0	0	0	0
PUBLIC/INSTITUTIONAL	0	0	0	4	25	56	21	0	0	0	0	0	0
TOTAL	0	0	0	27	160	353	136	0	0	0	0	0	0

SOURCE HDR SCIENCES, 1-NOV-80

Table 3.2-2. Net annual M-X-related land requirements (acres) by use category, by alternative in Beaver, assuming high baseline (page 1 of 2).

ALTERNATIVE / LAND USE CATEGORY	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
PROPOSED ACTION													
PERMANENT HOMES	0	0	13	27	88	129	30	49	-2	36	25	0	0
MOBILE HOMES	0	0	62	187	196	64	-43	-140	-179	74	14	0	0
RETAIL/COMM /INDUS	0	0	5	20	23	8	0	-5	-13	-9	2	0	0
STS AND HWYS	0	0	51	144	187	118	-14	-70	124	-25	2	0	0
PUBLIC/INSTITUTIONAL	0	0	12	45	93	18	-8	-21	-33	-15	0	0	0
TOTAL	0	0	146	437	565	345	-36	-193	-361	215	10	0	0
ALTERNATIVE 1													
PERMANENT HOMES	0	0	0	0	7	16	9	13	5	7	5	0	0
MOBILE HOMES	0	0	15	107	33	-78	-15	-47	-59	7	4	0	0
RETAIL/COMM /INDUS	0	0	2	12	4	-9	-2	-1	-3	0	0	0	0
STS. AND HWYS	0	0	11	73	28	-46	-4	-5	12	2	2	0	0
PUBLIC/INSTITUTIONAL	0	0	4	29	10	-23	-3	-2	-3	1	0	0	0
TOTAL	0	0	33	228	85	-144	-16	-14	-48	17	11	0	0
ALTERNATIVE 2													
PERMANENT HOMES	0	0	0	0	0	0	0	0	0	0	0	0	0
MOBILE HOMES	0	0	15	106	23	-110	-23	-7	-1	1	0	0	0
RETAIL/COMM /INDUS.	0	0	2	10	3	-10	-2	-1	2	0	0	0	0
STS. AND HWYS	0	0	11	72	16	-76	-16	-7	0	0	0	0	0
PUBLIC/INSTITUTIONAL	0	0	4	29	5	-28	-7	-3	0	0	0	0	0
TOTAL	0	0	33	224	49	-232	-49	-19	-3	1	0	0	0
ALTERNATIVE 3													
PERMANENT HOMES	0	0	0	0	0	0	0	0	0	0	0	0	0
MOBILE HOMES	7	15	40	95	36	-68	-7	-1	28	7	1	0	0
RETAIL/COMM /INDUS.	2	1	4	11	3	-11	-3	-1	-1	1	0	0	0
STS AND HWYS	5	10	28	65	24	-46	-6	0	18	7	1	0	0
PUBLIC/INSTITUTIONAL	1	2	10	27	8	-24	-3	0	-4	-1	0	0	0
TOTAL	15	29	85	204	74	-155	-17	-2	-41	15	2	0	0
ALTERNATIVE 4													
PERMANENT HOMES	0	0	0	0	0	0	0	0	0	0	0	0	0
MOBILE HOMES	7	15	40	95	36	-68	-7	-1	28	7	1	0	0
RETAIL/COMM /INDUS	2	1	4	11	3	-11	-3	-1	-1	1	0	0	0
STS. AND HWYS	5	10	28	65	24	-46	-6	0	18	7	1	0	0
PUBLIC/INSTITUTIONAL	1	2	10	27	8	-24	-3	0	-4	-1	0	0	0
TOTAL	15	29	85	204	74	-155	-19	-2	-41	15	2	0	0

Table 3.2-2. Net annual M-X-related land requirements (acres) by use category, by alternative in Beaver, assuming high baseline (page 2 of 2).

ALTERNATIVE 5													
PERMANENT HOMES	55	79	71	77	7	68	79	-75	33	0	0	0	1
MOBILE HOMES	139	175	178	202	-21	-278	-187	-129	20	0	0	0	0
RETAIL/COMM /INDUS	19	17	23	28	7	-20	-4	-8	2	1	0	0	0
STS. AND HWYS	130	166	179	193	-10	-137	-79	-133	1	0	0	0	0
PUBLIC/INSTITUTIONAL	38	40	46	50	-4	-56	-17	-26	1	0	0	0	0
TOTAL	388	490	532	586	-21	-459	-191	-380	10	1	0	0	1
ALTERNATIVE 6													
PERMANENT HOMES	55	79	71	77	7	68	79	-75	33	0	0	0	1
MOBILE HOMES	139	175	178	202	-21	-278	-187	-129	20	0	0	0	0
RETAIL/COMM /INDUS	19	17	23	28	7	-20	-4	-8	2	1	0	0	0
STS. AND HWYS	130	166	179	193	-10	-137	-79	-133	1	0	0	0	0
PUBLIC/INSTITUTIONAL	38	40	46	50	-4	-56	-17	-26	1	0	0	0	0
TOTAL	388	490	532	586	-21	-459	-191	-380	10	1	0	0	1
ALTERNATIVE 8A													
PERMANENT HOMES	0	0	0	0	0	0	0	0	0	0	0	0	0
MOBILE HOMES	0	0	0	12	62	91	-101	-64	0	0	0	0	0
RETAIL/COMM /INDUS	0	0	0	2	8	8	-11	-7	0	0	0	0	0
STS. AND HWYS	0	0	0	9	42	63	-70	-44	0	0	0	0	0
PUBLIC/INSTITUTIONAL	0	0	0	3	17	25	-20	-17	0	0	0	0	0
TOTAL	0	0	0	27	133	193	-217	-136	0	0	0	0	0

SOURCE: HDR SCIENCES, 26-OCT-80

Computation Equations

For total land uses:

(8) $L_c^t = H^t + M^t + C^t + S^t + G^t$

where L_c^t = Total community land requirements (in acres) in year t

H^t = Acres of permanent residential land required in year t

M^t = Acres of land for mobile homes required in year t

C^t = Acres of land for commercial uses required in year t

S^t = Acres of land for streets and highways required in year t

and G^t = Acres of land for public and institutional uses required in year t

For residential land uses

(9) $H^t = U_s^t D_s + U_r^t D_r$

where U_s^t = Number of single-family dwellings required in year t

D_s = Density factor for single-family housing = 3 units per acre

U_r^t = Number of units required in multi-unit structures in year t

and D_r = Density factor for multi-unit housing = 10 units per acre

(10) $M^t = U_m^t D_m$

where U_m^t = Number of mobile homes required in year t

and D_m = Density factor for mobile homes = 5 units per acre

For commercial/business land uses:

(11) $C^t = R^t + O^t + I^t$

where R^t = Acres of land required for retail sales uses in year t

O^t = Acres of land required for office-commercial uses in year t

and I^t = Acres of land required for industrial uses in year t

(12) $$R^t = \frac{\left[\sum_{ij} .31 \; Y_{ij}^t \; E_{ij} \right]}{V_r \; (43{,}560)} \quad (5)$$

where i = Employment cateogires from 1 to n = 7

j = Places of residence from 1 to n = 3

Y_{ij}^{t} = Aggregate gross personal income of the i^{th} employment category in the j^{th} residential location in year t

.31 = Proportion of income spent on retail goods, constant for all i and j

E_{ij} = Proportion of retail expenditures which are local for the i^{th} employment cateogry in j^{th} residential location (values shown in Table 3.1.2-1)

V_r = Retail sales volume in dollars per square foot of gross leasable building area, constant = $87/sq ft

5 = Multiple of building area to obtain total square feet required for building and ancillary activities such as parking

and 43,560 = conversion factor for acres

$$O^{t} = \frac{\left[\sum_{ij} .2\, Y_{ij}^{t}\ F_{ij} \right]}{V_o\ (43,560)} \quad (3.5)$$

(13)

where F_{ij} = Proportion of commercial services expenditures which are local for the i^{th} employment category in the j^{th} residential location (values shown in Table 3.1.2-1)

.2 = Proportion of income spent on commercial services, constant for all i and j

3.5 = Constant which is multiple of building area used to obtain total land required for building and ancillary activities such as parking

and V_o = Commercial sales volume per square foot of building area = $60/sq ft

(14) $I^{t} = .2\, E_c^{t}\ \frac{1.2\,(B + P)}{43,560}$

where E_c^{t} = Total employment in communities in year t

.2 = Proportion of employment which is in industrial categories

B = Constant which equals building area per employee

P = Constant which equals parking area per employee

1.2 = Factor for ancillary exterior area such as landscapping

For sheets and highways:

$$(15) \quad S^t = 1.76 \sum_{h=1}^{n} \frac{U_h^t (A_h)(100)}{43,560} + 1.1 \sum_{h=1}^{n} \frac{U_h^t (C_h)(60)}{43,560} + 1.1 \sum_{h=1}^{n} \frac{U_h^t (M_h)(50)}{43,560}$$

where U_h^t = Number of required units of housing type h, n = 3

A_h = Number of linear feet of arterial streets requried per unit of housing type h (shown in Table 3.1.5-1)

100 = Width of arterial right-of-way in feet

1.76 = Factor to allow for nonresidential requirements for arterial streets

43,560 = Conversion factor, sq ft to acres

C_h = Number of linear feet of collector streets required per unit of housing type h (shown in Table 3.1.5-1)

1.1 = Factor to allow for nonresidential requirements for collector streets and minor streets

60 = Width of collector street right-of-way in feet

M_h = Number of linear feet of minor streets required per unit of housing type h (shown in Table 3.1.5-1)

50 = Width of minor street right-of-way in feet

For public and institutional land uses:

$$(16) \quad G^t = .04 (E^t) + .0063 (P_c^t) + .000015 (P_c^t)$$

where E^t = M-X-related school enrollments in year t

.04 = Number of acres required per pupil for school sites

P_c^t = M-X-related in-migrant population resident in communities in year t

.0063 = Number of acres required per person for community park land

.000015 = Number of acres required per person per year for sanitary landfill sites

4.0 COMMUNITY FACILITIES AND SERVICES MODEL GROUP

4.1 MODEL STRUCTURE AND DESCRIPTION

This model group projects baseline and M-X-related facility and personnel requirements for five different types of community services: public schools, parks and recreation, public safety, health care, and solid waste disposal. These requirements are primarily determined as a function of population size and place of residence, with seven different categories of M-X-related population and three different types of residential locations differentiated in the models. The population in each employment-residential location category is multiplied by per capita factors which express normative standards for delivery of the various services. The requirements calculated by this method should be interpreted as referring only to the "demand" or need for service inputs, not as forecasts of how the supply of these service inputs would actually respond to M-X-generated demand for the services. The models, therefore, do not forecast changes in the supply of the services nor changes in the quality and attributes of service outputs (or outcomes). Changes in the supply of services are primarily a function of local policy and budgetary considerations and, in many instances, the location decisions of individual service providers such as physicians. These types of factors are not subject to prediction with any degree of confidence and are beyond the scope of the models discussed in the following sections.

As a practical matter, it is anticipated that the supply of services would increase to accommodate the long-term demand levels and shortfalls are likely to occur during the construction period when the maximum level of population in-migration is reached. This is likely to be especially the case for health services and parks and recreation facilties. Other services such as education and public safety would be more amenable to temporary expansion in short-term facilities (mobile classrooms and offices) staffed by short-term employees. Only when long-term population growth is projected, as in communities near operating bases, is construction of new permanent facilities anticipated.

4.1.1 Education Services

The education services sub-model provides baseline and M-X-related forecasts of the number of pupils in three grade categories, teacher requirements in the three grade categories, the number of new classrooms and school facilities for each grade category, and school construction costs, excluding land.

The number of school pupils (kindergarten through senior high school) is estimated for a) community-located population, and b) base-located population. This is accomplished in two steps. First, using the number of households per employment category, the average number of dependents under 20 years of age is derived for each household category. The number of dependents under age 20 per household varies by employment category as follows: 1.50 for construction workers, zero for assembly and checkout personnel, 1.30 for military operations family households, and 0.8 for both civilian operation and indirect worker households. Second, only 75 percent of the dependents are assumed to be of school age--i.e., age 5-18 years. The subtotals are summed to obtain the total number of pupils generated both on- and offbase. The total number of pupils is further subdivided into grade categories--50 percent in kindergarten through the sixth grade, 25 percent in grades seven through nine, and 25 percent in grades ten through twelve.

The number of teachers required to meet the increased enrollment is calculated by applying the following pupil/teacher ratios to the three respective grade categories: 25 to 1, 23 to 1, and 22 to 1. The number of new schools required is estimated utilizing a parameter defined as the average number of pupils per school at each grade category. The average school sizes assumed are 500, 800, and 1,000, respectively for elementary, junior high, and high schools. School construction costs are projected as a function of enrollments, space requirements per pupil, and costs per square foot of construction. Values for these parameters are assumed at 98 square feet per pupil and $45 per square foot (1978 dollars).

4.1.2 Public Safety Services

This sub-model computes projected baseline and M-X-related requirements and facility construction costs for law enforcement and fire protection. Demand for law enforcement services, and therefore personnel requirements, is assumed to be generated by the total population, whether resident in local communities, the operating base, or in construction camps. The requirements are further assumed to be invariant for all population categories, with a parameter value of 2.0 police officers per thousand population. Construction costs for law enforcement facilities such as police stations and detention centers are also assumed to be a function of population, with an estimated cost of $48 per person in 1978 dollars (Murphy/Williams, 1978).

The additional personnel needs associated with fire safety services are estimated in a manner similar to those for law enforcement services except that only the population resident in local communities is used to forecast needs. It is assumed that persons and property on the base will be provided fire protection services by the Air Force while the population in temporary construction camps is provided fire safety services by contractors. The personnel needs ratio is assumed to be invariant for all population groups at 1.65 fire personnel per 1,000 population residing in local communities (IMCA, 1979). Capital costs for facility construction are also a function of the same population segment and are estimated at $39 per capita in 1978 dollars (Murphy/Williams, 1978).

4.1.3 Community Parks and Recreation Services

The park and recreation sub-model projects only facility or land requirements, rather than personnel. Needs for three types of recreation facilities--playgrounds, neighborhood parks, and community parks--are a function of the size of the population residing in local communities, and exclude the population living on the base or in construction camps. Recreation services and facilities are assumed to be provided onbase by the Air Force, while transient construction workers are unlikely to demand the types of services usually obtained at community parks. The requirements per person resident in communities are assumed to be .001 acres for playgrounds, .0013 acres for neighborhood parks, and .004 acres for community parks and open space. These per capita requirements, standards developed by the National Park and Recreation Association for urban communities, are likely to result in overestimates of the needs for additional parks in small, rural-oriented communities such as those found in the study areas of Nevada/Utah and Texas/New Mexico. The abundance of developed rural outdoor recreation sites in the regions being examined and apparent preferences by many residents for recreation activities at dispersed sites suggest that demand for community recreation facilities will be less than would be the case in urban communities.

4.1.4 Solid Waste Disposal Services

This sub-model projects quantity of solid waste generated, in terms of both weight and volume, and the quantity of land (sanitary landfill) required for solid waste disposal. As in the case of fire protection and park services, only the population projected to reside in communities is presumed to generate demand for this local service; onbase solid waste disposal requirements are assumed to be provided by the Air Force while contractors would dispose of solid waste generated in construction camps. The per capita solid waste generation rate assumed is 5.0 pounds per day, which creates a requirement of 0.000015 acres per person per year (Architects/Planners Alliance, Inc., 1979).

4.1.5 Health Services

Needs for health services personnel, including physicians, nurses, dentists, mental health workers, and other support personnel, are projected as a function of population residing in local communities. Population residing onbase or in construction camps is excluded since the Air Force and contractors are expected to provide the major share of health services for those population groups. The model differentiates varying levels of needs for each of seven population groups. The highest level is associated with base civilian and indirect worker populations, while lower levels of demand for local health services are associated with construction and assembly and checkout populations. The lower level of demand assumed for these groups is due to their temporary residency in the affected communities as well as to their age distribution which is younger than the general population. Military households residing in local communities are assumed to generate no demand for private health services since such services would be available on the base. A similar pattern is assumed for hospital bed requirements for the various population categories. These standards, expressed as requirements per 1,000 population are shown in Table 4.1.5-1 for each population group resident in local communities.

4.2 SAMPLE COMMUNITY SERVICES AND FACILITIES MODEL OUTPUTS AND COMPUTATIONAL PROCEDURES

Illustrative community services and facilities model summary outputs are presented in Tables 4.2-1 through 4.2-6, which show M-X-related additional school enrollments, teacher requirements, health facilities and personnel requirements, requirements for additional law enforcement and fire safety personnel, and land requirements for parks and recreation. Unsummarized model outputs for the Proposed Action in Beaver County, Utah, with more detail by employment category and place of residence, are shown in Appendix Table A-1. The following sections describe each summary output table in terms of how it should be interpreted and the equations for computing values for the variables.

SCHOOL ENROLLMENTS (TABLE 4.2-1)

The school age population projected to be generated by the project that would be present in the county (or region) is shown by grade category for Beaver County, Utah each year from 1982 through 1994. In addition, the table indicates the projected total baseline represented by the M-X-related enrollments. The data are shown separately for each alternative that might affect a particular county. School enrollments are computed separately for the base, where applicable, and the

Table 4.1.5-1. Health services personnel and hospital bed requirements per 1,000 persons, by population category for the population resident, in local communities.

POPULATION CATEGORY	HEALTH PERSONNEL REQUIREMENTS PER 1,000 POPULATION					HOSPITAL BED REQUIREMENTS PER CAPITA
	PHYSICIANS	DENTISTS	NURSES	MENTAL HEALTH	OTHER	
Base Construction	1.0	0.3	3.5	0.21	2.0	2.0
Base Assembly and Check-out	1.0	0.15	1.8	0.11	1.0	2.0
Cluster Construction	1.0	0.3	3.5	0.21	2.0	0.0
Cluster Assembly and Check-out	0.5	0.15	1.8	0.11	1.0	0.0
Military Operations	0.0	0.0	0.0	0.0	0.0	0.0
Civilian Operations	1.5	0.53	4.5	0.27	2.5	4.0
Indirect	1.5	0.53	4.5	0.27	2.5	4.0

1204-1

Source: Estimated by HDR Sciences.

Table 4.2-1. Projected baseline and M-X-induced school enrollments by grade level, by alternative, in Beaver, assuming high baseline (page 1 of 2).

ALTERNATIVE / NUMBER PUPILS BY GRADE LEVEL	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
BASELINE ENROLLMENTS	1702	2252	2557	2858	3115	2605	2525	2551	2590	2633	2675	2718	2747
PROPOSED ACTION													
K-6	0	0	122	592	1494	1992	2222	2355	2014	1865	1865	1865	1865
7-9	0	0	61	296	747	996	1111	1177	1007	933	933	933	932
10-12	0	0	61	296	747	996	1111	1177	1007	933	933	933	932
TOTAL M-X RELATED	0	0	244	1183	2988	3984	4445	4709	4027	3731	3730	3730	3730
M-X PLUS BASELINE	1702	2252	2801	4041	6103	6589	6970	7260	6617	6364	6405	6448	6477
PERCENT DIFFERENCE FROM B. SELINE	0 0	0 0	9 5	41 4	95 9	152 9	176 0	184 5	155 4	141 7	139 4	137 2	135 8
ALTERNATIVE 1													
K 6	0	0	44	351	458	218	177	155	122	116	116	115	115
7-9	0	0	22	175	229	109	88	77	61	58	58	58	58
10-12	0	0	22	175	229	109	88	77	61	58	58	58	58
TOTAL M-X RELATED	0	0	88	702	916	436	354	310	243	233	231	231	230
M-X PLUS BASELINE	1702	2252	2645	3560	4031	3041	2879	2861	2833	2866	2906	2949	2977
PERCENT DIFFERENCE FROM BASELINE	0 0	0 0	3 4	24 6	29 4	16 7	14 0	12 1	9 4	8 8	8 6	8 5	8 4
ALTERNATIVE 2													
K-6	0	0	44	348	413	96	31	6	3	3	3	3	3
7-9	0	0	22	174	206	48	16	3	2	2	2	2	1
10-12	0	0	22	174	206	48	16	3	2	2	2	2	1
TOTAL M-X RELATED	0	0	88	695	826	193	63	12	7	7	6	6	6
M-X PLUS BASELINE	1702	2252	2645	3553	3941	2798	2588	2563	2597	2640	2681	2724	2753
PERCENT DIFFERENCE FROM BASELINE	0 0	0 0	3 4	24 3	26 5	7 4	2 5	0 5	0 3	0 3	0 2	0 2	0 2
ALTERNATIVE 3													
K-6	15	40	136	431	517	254	218	211	171	160	159	159	158
7-9	7	20	68	215	258	127	109	105	86	80	79	79	79
10-12	7	20	68	215	258	127	109	105	86	80	79	79	79
TOTAL M-X RELATED	30	80	272	861	1033	508	435	422	343	320	318	317	317
M-X PLUS BASELINE	1732	2332	2829	3719	4148	3113	2960	2973	2933	2953	2993	3035	3064
PERCENT DIFFERENCE FROM BASELINE	1 8	3 6	10 6	30 1	33 2	19 5	17 2	16 5	13 2	12 1	11 9	11 7	11 5
ALTERNATIVE 4													
K-6	15	40	136	431	517	254	218	211	171	160	159	159	158
7-9	7	20	68	215	258	127	109	105	86	80	79	79	79
10-12	7	20	68	215	258	127	109	105	86	80	79	79	79
TOTAL M-X RELATED	30	80	272	861	1033	508	435	422	343	320	318	317	317
M-X PLUS BASELINE	1732	2332	2829	3719	4148	3113	2960	2973	2933	2953	2993	3035	3064
PERCENT DIFFERENCE FROM BASELINE	1 8	3 6	10 6	30 1	33 2	19 5	17 2	16 5	13 2	12 1	11 9	11 7	11 5

Table 4.2-1. Projected baseline and M-X-induced school entrollments by grade level, by alternative, in Beaver assuming high baseline (page 2 of 2).

ALTERNATIVE 5													
K-6	385	803	1547	2362	2605	2295	2421	2457	2454	2454	2454	2454	2454
7-9	193	401	773	1181	1303	1147	1210	1229	1227	1227	1227	1227	1227
10-12	193	401	773	1181	1303	1147	1210	1229	1227	1227	1227	1227	1227
TOTAL M-X RELATED	770	1605	3093	4724	5211	4590	4842	4914	4909	4909	4908	4908	4908
M-X PLUS BASELINE	2472	3857	5650	7582	8326	7195	7367	7465	7499	7542	7583	7626	7655
PERCENT DIFFERENCE FROM BASELINE	45 2	71 3	121 0	165 3	167 3	176 1	191 7	192 6	189 5	186 4	183 4	180 6	178 7
ALTERNATIVE 6													
K-6	385	803	1547	2362	2605	2295	2421	2457	2454	2454	2454	2454	2454
7-9	193	401	773	1181	1303	1147	1210	1229	1227	1227	1227	1227	1227
10-12	193	401	773	1181	1303	1147	1210	1229	1227	1227	1227	1227	1227
TOTAL M-X RELATED	770	1605	3093	4724	5211	4590	4842	4914	4909	4909	4908	4908	4908
M-X PLUS BASELINE	2472	3857	5650	7582	8326	7195	7367	7465	7499	7542	7583	7626	7655
PERCENT DIFFERENCE FROM BASELINE	45 2	71 3	121 0	165 3	167 3	176 1	191 7	192 6	189 5	186 4	183 4	180 6	178 7
ALTERNATIVE 8A													
K-6	0	0	0	36	214	475	184	0	0	0	0	0	0
7-9	0	0	0	18	107	238	92	0	0	0	0	0	0
10-12	0	0	0	18	107	238	92	0	0	0	0	0	0
TOTAL M-X RELATED	0	0	0	71	428	951	367	0	0	0	0	0	0
M-X PLUS BASELINE	1702	2252	2557	2929	3543	3556	2892	2551	2590	2633	2675	2718	2747
PERCENT DIFFERENCE FROM BASELINE	0 0	0 0	0 0	2 5	13 7	36 5	14 5	0 0	0 0	0 0	0 0	0 0	0 0

SOURCE HDR SCIENCES, 1-NOV-80

Table 4.2-2. Projected baseline and M-X-induced teacher requirements by grade level, by alternative, in Beaver, assuming high baseline (page 1 of 2).

ALTERNATIVE / NUMBER TEACHERS BY GRADE LEVEL	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
BASELINE REQUIREMENTS	77	102	116	129	141	118	114	115	117	119	121	123	124
PROPOSED ACTION													
K-6	0	0	5	24	60	80	89	94	81	75	75	75	75
7-9	0	0	3	13	32	43	48	51	44	41	41	41	41
10-12	0	0	3	13	34	45	51	54	46	42	42	42	42
TOTAL M-X RELATED	0	0	10	50	126	168	188	199	170	158	158	158	158
M-X PLUS BASELINE	77	102	126	179	267	286	302	314	287	277	279	281	282
PERCENT DIFFERENCE FROM BASELINE	0 0	0 0	8 6	38 5	89 0	141 8	163 7	171 6	144 4	132 0	129 9	127 9	126 5
ALTERNATIVE 1													
K-6	0	0	2	14	18	9	7	6	5	5	5	5	5
7-9	0	0	1	8	10	5	4	3	3	3	3	3	3
10-12	0	0	1	8	10	5	4	4	3	3	3	3	3
TOTAL M-X RELATED	0	0	4	30	39	18	15	13	10	10	10	10	10
M-X PLUS BASELINE	77	102	120	159	180	136	129	128	127	129	131	133	134
PERCENT DIFFERENCE FROM BASELINE	0 0	0 0	3 4	23 1	27 5	15 2	13 1	11 2	8 5	8 4	8 2	8 1	8 0
ALTERNATIVE 2													
K-6	0	0	2	14	17	4	1	0	0	0	0	0	0
7-9	0	0	1	8	9	2	1	0	0	0	0	0	0
10-12	0	0	1	8	9	2	1	0	0	0	0	0	0
TOTAL M-X RELATED	0	0	4	29	35	8	3	1	0	0	0	0	0
M-X PLUS BASELINE	77	102	120	158	176	126	117	116	117	119	121	123	124
PERCENT DIFFERENCE FROM BASELINE	0 0	0 0	3 4	22 3	24 7	6 8	2 6	0 9	0 0	0 0	0 0	0 0	0 0
ALTERNATIVE 3													
K-6	1	2	5	17	21	10	9	8	7	6	6	6	6
7-9	0	1	3	9	11	6	5	5	4	3	3	3	3
10-12	0	1	3	10	12	6	5	5	4	4	4	4	4
TOTAL M-X RELATED	1	3	11	36	44	21	18	18	14	14	13	13	13
M-X PLUS BASELINE	78	105	127	165	185	139	132	133	131	133	134	136	137
PERCENT DIFFERENCE FROM BASELINE	1 3	2 9	9 5	27 7	31 1	17 7	15 7	15 5	11 9	11 7	10 7	10 5	10 4
ALTERNATIVE 4													
K-6	1	2	5	17	21	10	9	8	7	6	6	6	6
7-9	0	1	3	9	11	6	5	5	4	3	3	3	3
10-12	0	1	3	10	12	6	5	5	4	4	4	4	4
TOTAL M-X RELATED	1	3	11	36	44	21	18	18	14	14	13	13	13
M-X PLUS BASELINE	78	105	127	165	185	139	132	133	131	133	134	136	137
PERCENT DIFFERENCE FROM BASELINE	1 3	2 9	9 5	27 7	31 1	17 7	15 7	15 5	11 9	11 7	10 7	10 5	10 4

Table 4.2-2. Projected baseline and M-X-induced teacher requirements by grade level, by alternative, in Beaver, assuming high baseline (page 2 of 2).

ALTERNATIVE 5													
K-6	15	32	62	94	104	92	97	98	98	98	98	98	98
7-9	8	17	34	51	57	50	53	53	53	53	53	53	53
10-12	9	18	35	54	59	52	55	56	56	56	56	56	56
TOTAL M-X RELATED	33	68	131	200	220	194	204	208	207	207	207	207	207
M-X PLUS BASELINE	110	170	247	329	361	312	318	323	324	326	328	330	331
PERCENT DIFFERENCE FROM BASELINE	42.6	66.4	112.7	153.9	155.4	163.8	177.7	179.3	175.8	172.9	170.2	167.5	165.8
ALTERNATIVE 6													
K-6	15	32	62	94	104	92	97	98	98	98	98	98	98
7-9	8	17	34	51	57	50	53	53	53	53	53	53	53
10-12	9	18	35	54	59	52	55	56	56	56	56	56	56
TOTAL M-X RELATED	33	68	131	200	220	194	204	208	207	207	207	207	207
M-X PLUS BASELINE	110	170	247	329	361	312	318	323	324	326	328	330	331
PERCENT DIFFERENCE FROM BASELINE	42.6	66.4	112.7	153.9	155.4	163.8	177.7	179.3	175.8	172.9	170.2	167.5	165.8
ALTERNATIVE 8A													
K-6	0	0	0	1	7	19	7	0	0	0	0	0	0
7-9	0	0	0	1	5	10	4	0	0	0	0	0	0
10-12	0	0	0	1	5	11	4	0	0	0	0	0	0
TOTAL M-X RELATED	0	0	0	3	18	40	16	0	0	0	0	0	0
M-X PLUS BASELINE	77	102	116	132	159	158	130	115	117	119	121	123	124
PERCENT DIFFERENCE FROM BASELINE	0.0	0.0	0.0	2.3	12.7	33.8	13.9	0.0	0.0	0.0	0.0	0.0	0.0

SOURCE: HDR SCIENCES, 1-NOV-80

Table 4.2-3. Projected baseline and M-X-related health services and hospital bed requirements, in Beaver, assuming high baseline (page 1 of 2).

ALTERNATIVE / REQUIREMENTS	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
BASELINE													
PHYSICIANS	9	12	14	16	17	15	14	14	14	15	15	15	15
REGISTERED NURSES	29	38	44	49	53	45	43	44	44	45	46	47	47
DENTISTS	3	4	5	5	6	5	5	5	5	5	5	5	5
MENTAL HEALTH PERSON	1	2	2	2	3	2	2	2	2	2	2	2	2
HOSPITAL BEDS	26	34	39	43	47	40	38	39	39	40	41	41	42
PROPOSED ACTION													
PHYSICIANS	0	0	1	5	9	12	11	8	5	3	3	3	3
REGISTERED NURSES	0	0	3	13	26	37	35	26	15	9	9	9	9
DENTISTS	0	0	0	1	2	4	3	3	1	1	1	1	1
MENTAL HEALTH PERSON	0	0	0	0	1	2	2	1	1	0	0	0	0
HOSPITAL BEDS	0	0	3	12	22	30	29	22	14	8	8	8	8
ALTERNATIVE 1													
PHYSICIANS	0	0	0	2	2	1	1	0	0	0	0	0	0
REGISTERED NURSES	0	0	0	3	4	3	3	2	1	1	1	1	1
DENTISTS	0	0	0	0	0	0	0	0	0	0	0	0	0
MENTAL HEALTH PERSON	0	0	0	0	0	0	0	0	0	0	0	0	0
HOSPITAL BEDS	0	0	0	4	5	3	2	2	1	1	0	0	0
ALTERNATIVE 2													
PHYSICIANS	0	0	0	2	2	0	0	0	0	0	0	0	0
REGISTERED NURSES	0	0	0	3	4	1	0	0	0	0	0	0	0
DENTISTS	0	0	0	0	0	0	0	0	0	0	0	0	0
MENTAL HEALTH PERSON	0	0	0	0	0	0	0	0	0	0	0	0	0
HOSPITAL BEDS	0	0	0	4	4	1	0	0	0	0	0	0	0
ALTERNATIVE 3													
PHYSICIANS	0	0	1	2	2	1	1	1	0	0	0	0	0
REGISTERED NURSES	0	1	2	4	5	4	4	4	2	1	1	1	1
DENTISTS	0	0	0	0	0	0	0	0	0	0	0	0	0
MENTAL HEALTH PERSON	0	0	0	0	0	0	0	0	0	0	0	0	0
HOSPITAL BEDS	0	1	2	4	5	4	3	3	2	1	1	1	1
ALTERNATIVE 4													
PHYSICIANS	0	0	1	2	2	1	1	1	0	0	0	0	0
REGISTERED NURSES	0	1	2	4	5	4	4	4	2	1	1	1	1
DENTISTS	0	0	0	0	0	0	0	0	0	0	0	0	0
MENTAL HEALTH PERSON	0	0	0	0	0	0	0	0	0	0	0	0	0
HOSPITAL BEDS	0	1	2	4	5	4	3	3	2	1	1	1	1

Table 4.2-3. Projected baseline and M-X-related health services and hospital bed requirements, in Beaver, assuming high baseline (page 2 of 2).

ALTERNATIVE 5													
PHYSICIANS	9	18	12	17	16	11	8	4	4	4	4	4	4
REGISTERED NURSES	11	25	38	49	46	34	26	12	12	12	12	12	12
DENTISTS	1	2	4	5	5	4	3	1	1	1	1	1	1
MENTAL HEALTH PERSON	0	1	2	3	3	2	1	0	0	0	0	0	0
HOSPITAL BEDS	8	19	31	42	40	30	23	11	11	11	11	11	11
ALTERNATIVE 6													
PHYSICIANS	9	18	12	17	16	11	8	4	4	4	4	4	4
REGISTERED NURSES	11	25	38	49	46	34	26	12	12	12	12	12	12
DENTISTS	1	2	4	5	5	4	3	1	1	1	1	1	1
MENTAL HEALTH PERSON	0	1	2	3	3	2	1	0	0	0	0	0	0
HOSPITAL BEDS	8	19	31	42	40	30	23	11	11	11	11	11	11
ALTERNATIVE 8A													
PHYSICIANS	0	0	0	0	1	2	1	0	0	0	0	0	0
REGISTERED NURSES	0	0	0	0	2	5	1	0	0	0	0	0	0
DENTISTS	0	0	0	0	0	0	0	0	0	0	0	0	0
MENTAL HEALTH PERSON	0	0	0	0	0	0	0	0	0	0	0	0	0
HOSPITAL BEDS	0	0	0	0	2	5	2	0	0	0	0	0	0

SOURCE HDR SCIENCES. 1-NOV-80

Table 4.2-4. Projected baseline and M-X-related requirements for law enforcement personnel by alternative, in Beaver, assuming high baseline.

ALTERNATIVE / PERSONNEL REQUIREMENTS	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
BASELINE REQUIREMENTS	13	17	19	21	23	20	19	19	19	20	20	20	21
PROPOSED ACTION													
M-X REQUIREMENTS	0	0	2	10	24	32	34	35	29	26	26	26	26
M-X PLUS BASELINE	13	17	21	31	47	52	53	54	48	46	46	46	47
PERCENT DIFFERENCE FROM BASELINE	0 0	0 0	10 2	45 5	100 1	159 6	175 0	178 3	145 5	128 3	126 3	124 3	123 0
ALTERNATIVE 1													
M-X REQUIREMENTS	0	0	0	5	7	3	2	2	1	1	1	1	1
M-X PLUS BASELINE	13	17	19	26	30	23	21	21	20	21	21	21	22
PERCENT DIFFERENCE FROM BASELINE	0 0	0 0	0 0	22 7	29 2	15 0	10 3	10 2	5 0	4 9	4 9	4 8	4 7
ALTERNATIVE 2													
M-X REQUIREMENTS	0	0	0	5	7	1	0	0	0	0	0	0	0
M-X PLUS BASELINE	13	17	19	26	30	21	19	19	19	20	20	20	21
PERCENT DIFFERENCE FROM BASELINE	0 0	0 0	0 0	22 7	29 2	5 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
ALTERNATIVE 3													
M-X REQUIREMENTS	0	0	2	7	8	4	3	3	2	2	2	2	2
M-X PLUS BASELINE	13	17	21	28	31	24	22	22	21	22	22	22	23
PERCENT DIFFERENCE FROM BASELINE	0 0	0 0	10 2	31 8	33 4	20 0	15 4	15 3	10 0	9 9	9 7	9 6	9 5
ALTERNATIVE 4													
M-X REQUIREMENTS	0	0	2	7	8	4	3	3	2	2	2	2	2
M-X PLUS BASELINE	13	17	21	28	31	24	22	22	21	22	22	22	23
PERCENT DIFFERENCE FROM BASELINE	0 0	0 0	10 2	31 8	33 4	20 0	15 4	15 3	10 0	9 9	9 7	9 6	9 5
ALTERNATIVE 5													
M-X REQUIREMENTS	6	15	27	42	48	41	41	39	34	34	34	34	34
M-X PLUS BASELINE	19	32	46	63	71	61	60	58	53	54	54	54	55
PERCENT DIFFERENCE FROM BASELINE	45 8	86 6	137 3	191 0	200 3	204 5	211 0	198 7	170 6	167 8	165 2	162 6	160 9
ALTERNATIVE 6													
M-X REQUIREMENTS	6	15	27	42	48	41	41	39	34	34	34	34	34
M-X PLUS BASELINE	19	32	46	63	71	61	60	58	53	54	54	54	55
PERCENT DIFFERENCE FROM BASELINE	45 8	86 6	137 3	191 0	200 3	204 5	211 0	198 7	170 6	167 8	165 2	162 6	160 9
ALTERNATIVE 8A													
M-X REQUIREMENTS	0	0	0	0	3	8	3	0	0	0	0	0	0
M-X PLUS BASELINE	13	17	19	21	26	28	22	19	19	20	20	20	21
PERCENT DIFFERENCE FROM BASELINE	0 0	0 0	0 0	0 0	12 5	39 9	15 4	0 0	0 0	0 0	0 0	0 0	0 0

SOURCE: MDR SCIENCES, 1 NOV-80

Table 4.2-5. Projected baseline and M-X-related requirements for fire protection personnel by alternative, in Beaver, assuming high baseline.

ALTERNATIVE / PERSONNEL REQUIREMENTS	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
BASELINE REQUIREMENTS	10	14	16	18	19	16	16	16	16	16	16	17	17
PROPOSED ACTION													
M-X REQUIREMENTS	0	0	1	7	13	17	16	13	9	7	7	7	7
M-X PLUS BASELINE	10	14	17	25	32	33	32	29	25	23	23	24	24
PERCENT DIFFERENCE FROM BASELINE	0.0	0.0	6.2	38.6	65.7	102.8	99.8	80.3	54.7	41.9	41.2	40.6	40.2
ALTERNATIVE 1													
M-X REQUIREMENTS	0	0	0	3	4	2	2	1	1	1	1	1	1
M-X PLUS BASELINE	10	14	16	21	23	18	18	17	17	17	17	18	18
PERCENT DIFFERENCE FROM BASELINE	0.0	0.0	0.0	16.5	20.2	12.1	12.5	6.2	6.1	6.0	5.9	5.8	5.7
ALTERNATIVE 2													
M-X REQUIREMENTS	0	0	0	3	4	0	0	0	0	0	0	0	0
M-X PLUS BASELINE	10	14	16	21	23	16	16	16	16	16	16	17	17
PERCENT DIFFERENCE FROM BASELINE	0.0	0.0	0.0	16.5	20.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ALTERNATIVE 3													
M-X REQUIREMENTS	0	0	1	4	5	3	2	2	2	2	1	1	1
M-X PLUS BASELINE	10	14	17	22	24	19	18	18	18	18	17	18	18
PERCENT DIFFERENCE FROM BASELINE	0.0	0.0	6.2	22.1	25.3	18.1	12.5	12.4	12.2	12.0	5.9	5.8	5.7
ALTERNATIVE 4													
M-X REQUIREMENTS	0	0	1	4	5	3	2	2	2	2	1	1	1
M-X PLUS BASELINE	10	14	17	22	24	19	18	18	18	18	17	18	18
PERCENT DIFFERENCE FROM BASELINE	0.0	0.0	6.2	22.1	25.3	18.1	12.5	12.4	12.2	12.0	5.9	5.8	5.7
ALTERNATIVE 5													
M-X REQUIREMENTS	4	10	16	22	22	16	13	9	9	9	9	9	9
M-X PLUS BASELINE	14	24	32	40	41	32	29	25	25	25	25	26	26
PERCENT DIFFERENCE FROM BASELINE	37.0	70.0	98.6	121.3	111.3	96.7	81.1	55.6	54.7	53.8	53.0	52.2	51.6
ALTERNATIVE 6													
M-X REQUIREMENTS	4	10	16	22	22	16	13	9	9	9	9	9	9
M-X PLUS BASELINE	14	24	32	40	41	32	29	25	25	25	25	26	26
PERCENT DIFFERENCE FROM BASELINE	37.0	70.0	98.6	121.3	111.3	96.7	81.1	55.6	54.7	53.8	53.0	52.2	51.6
ALTERNATIVE 8A													
M-X REQUIREMENTS	0	0	0	0	2	4	1	0	0	0	0	0	0
M-X PLUS BASELINE	10	14	16	18	21	20	17	16	16	16	16	17	17
PERCENT DIFFERENCE FROM BASELINE	0.0	0.0	0.0	0.0	10.1	24.2	6.2	0.0	0.0	0.0	0.0	0.0	0.0

SOURCE: HDR SCIENCES, 1-NOV 80

Table 4.2-6. Projected M-X-related land requirements for parks and playgrounds, by alternative, in Beaver, assuming high baseline.

ALTERNATIVE / LAND REQUIREMENTS	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
PROPOSED ACTION													
PLAYGROUNDS	0	0	1	4	8	10	10	8	6	4	4	4	4
NEIGHBORHOOD PARKS	0	0	1	6	11	13	13	11	7	6	6	6	6
COMMUNITY PARKS	0	0	4	17	33	41	40	34	23	17	17	17	17
TOTAL	0	0	6	27	52	64	63	53	36	27	27	27	27
ALTERNATIVE 1													
PLAYGROUNDS	0	0	0	2	3	1	1	1	1	1	1	1	1
NEIGHBORHOOD PARKS	0	0	0	3	3	2	2	2	1	1	1	1	1
COMMUNITY PARKS	0	0	1	8	11	6	5	5	4	3	3	3	3
TOTAL	0	0	1	13	17	9	8	8	6	5	5	5	5
ALTERNATIVE 2													
PLAYGROUNDS	0	0	0	2	2	1	0	0	0	0	0	0	0
NEIGHBORHOOD PARKS	0	0	0	3	3	1	0	0	0	0	0	0	0
COMMUNITY PARKS	0	0	1	8	10	2	1	0	0	0	0	0	0
TOTAL	0	0	1	13	15	4	1	0	0	0	0	0	0
ALTERNATIVE 3													
PLAYGROUNDS	0	0	1	3	3	2	2	2	1	1	1	1	1
NEIGHBORHOOD PARKS	0	0	1	3	4	2	2	2	2	2	2	2	2
COMMUNITY PARKS	0	1	4	10	13	7	7	7	5	5	5	5	5
TOTAL	0	1	6	16	20	11	11	11	8	8	8	8	8
ALTERNATIVE 4													
PLAYGROUNDS	0	0	1	3	3	2	2	2	1	1	1	1	1
NEIGHBORHOOD PARKS	0	0	1	3	4	2	2	2	2	2	2	2	2
COMMUNITY PARKS	0	1	4	10	13	7	7	7	5	5	5	5	5
TOTAL	0	1	6	16	20	11	11	11	8	8	8	8	8
ALTERNATIVE 5													
PLAYGROUNDS	3	6	10	14	14	10	8	6	6	6	6	6	6
NEIGHBORHOOD PARKS	4	8	13	18	18	13	11	7	7	7	7	7	7
COMMUNITY PARKS	11	25	40	55	54	40	33	23	23	23	23	23	23
TOTAL	18	39	63	87	86	63	52	36	36	36	36	36	36
ALTERNATIVE 6													
PLAYGROUNDS	3	6	10	14	14	10	8	6	6	6	6	6	6
NEIGHBORHOOD PARKS	4	8	13	18	18	13	11	7	7	7	7	7	7
COMMUNITY PARKS	11	25	40	55	54	40	33	23	23	23	23	23	23
TOTAL	18	39	63	87	86	63	52	36	36	36	36	36	36
ALTERNATIVE 8A													
PLAYGROUNDS	0	0	0	0	1	1	1	0	0	0	0	0	0
NEIGHBORHOOD PARKS	0	0	0	0	2	4	1	0	0	0	0	0	0
COMMUNITY PARKS	0	0	0	1	5	11	4	0	0	0	0	0	0
TOTAL	0	0	0	1	8	16	6	0	0	0	0	0	0

SOURCE: HDR SCIENCES, 1-NOV-80

community, with total county enrollments the sum of the two places. More detailed data are shown in Appendix Table A-1, including enrollments by employment category and place of residence.

Computational Equations

(17) $E_T^t = E_c^t + E_b^t$

where E_T^t = Total in-migrant school-age population in year t

E_c^t = In-migrant school-age populstion resident in communities in year t

and E_b^t = In-migrant school-age population resident onbase in year t

(18) $E_c^t = E_{kc}^t + E_{jc}^t + E_{hc}^t$

where E_{kc}^t = Kindergarten through grade 6 enrollments in year t

E_{jc}^t = Junior high school enrollments in yesar t

and E_{hc}^t = High school enrollments in year t

(19) $$F_c^t = .5\left[\sum_{i=1}^{n} H_{ic}^t (A_i - 2)(.75)\right] + .25\left[\sum_{i-1}^{n} H_{ic}^t (A_i - 2)(.75)\right] + .25\left[\sum_{i=1}^{n} H_{ic}^t (A_i - 2)(.75)\right]$$

where i = Employment/population categories and n = 7

H_{ic}^t = Number of households in population category i resident in communities in year t

A_i = Average household size for population category i

2 = Number of adults over age 20 per household

.75 = Proportion of population under age 20 between the ages of 5 and 18

.5 = Proportion of school-age population in grades k-6

.25 = Proportion of school-age population in grades 7-9 and 10-12.

$$(20) \quad E_b^t = .5\left[H_{mb}^t (A_m - 2)(.75)\right] + .25\left[H_{mb}^t (A_m - 2)(.75)\right] + .25\left[H_{mb}^t (A_m - 2)(.75)\right]$$

where H_{mb}^t = Number of military households resident onbase in year t

A_m = Average family household size for military households = 3.3 and other factors are as in equation 19

TEACHER REQUIREMENTS (TABLE 4.2-2)

The table indicates, by grade category, the number of teachers that would be necessary to accommodate the M-X-related enrollments present in the county if the standards for pupil-teacher ratios, discussed in Section 4.1.1, are maintained. The table also shows the number of teachers required for the baseline pupils and the percent change over the baseline represented by M-X-relaed requirements. The data should be interpreted as estimates of needs for additional teachers, not as forecasts of how the supply of teachers would respond to M-X induced demand.

Computation Equation

$$(21) \quad T_s^t = \frac{E_{kc}^t + E_{kb}^t}{25} + \frac{E_{jc}^t + E_{jb}^t}{23} + \frac{E_{hc}^t + E_{hb}^t}{22}$$

where T_s^t = Total requirements for additional teachers in year t

E_{kc}^t = Number of pupils in grades K-6 persent in communities in year t

E_{kb}^t = Number of pupils in grades K-6 resident onbase in year t

25 = Pupil-teacher ratio for grades K-6

E_{jc}^t = Number of pupils in grades 7-9 present in communities in year t

E_{jb}^t = Number of pupils in grades 7-9 resident onbase in year t

23 = Pupil-teacher ratio for grades 7-9

E_{hc}^t = Number of pupils in grades 10-12 present in communities in year t

E_{hb}^t = Number of pupils in grades 10-12 resident onbase in year t

22 = Pupil-teacher ratio for grades 10-12

HEALTH SERVICES PERSONNEL AND HOSPITAL BED REQUIREMENTS (TABLE 4.2-3)

The table presents the number of physicians, registered nurses, dentists, mental health personnel, and hospital beds required to provide health services to the baseline population and to the in-migrant population generated by the M-X project in the county. The data, which are presented separately for each alternative, should be interpreted as demand or need for additional personnel and facilities, not as predictions of how supply would respond to needs. Needs for additional health services during the peak construction period greatly exceed the long-term or permanent requirements in most counties. Unless special measures are undertaken to recruit specialized health services personnel, it is likely that supply would not exceed the long-term requirements. Shortfalls during the peak period may lead to deterioration in the quality of services, time delays in obtaining services, or may necessitate travel outside the local area to obtain health services.

Computation Equations

For Physicians

$$(22) \quad D^t = \sum_{i=1}^{n} P_{ic}^t S_{id}$$

where D^t = Number of physicians needed in year t

P_{ic}^t = In-migrant population in category i resident in communities in year t

and S_{id} = Standard for physician-population ratio for population category i (shown in Table 4.1.5-1)

For Registered Nurses:

$$(23) \quad N^t = \sum_{i=1}^{n} P_{ic}^t S_{in}$$

where N^t = Number of nurses needed in year t

S_{in} = Standard for nurse-population ratio for population category i (shown in Table 4.1.5-1)

For Mental Health:

$$(24) \quad M^t = \sum_{i=1}^{n} P_{ic}^t S_{im}$$

where M^t = Number of mental health personnel needed in year t

S_{im} = Standard for mental health personnel-population ratio for population category i (Table 4.1.5-1)

For Dentists:

(25) $O^t = \sum_{i=1}^{n} P_{ic}^t S_{io}$

where O^t = Number of dentists needed in year t

S_{io} = Standard for dentist-population ratio for population category i

For Hospital Beds:

(26) $B^t = \sum_{i=1}^{n} P_{ic}^t S_{ib}$

where B^t = Number of hospital beds needed in year t

S_{ib} = Standard for hospital bed-population ratio for population category i

LAW ENFORCEMENT PERSONNEL REQUIREMENTS (TABLE 4.2-4)

The table presents estimates of the additional numbers of law enforcement personnel needed to provide services to the M-X-related in-migrant population, personnel requirements to provide services to the baseline pouplation, and the percent change over the baseline represented by the M-X demand. The data, which are presented separately for each alternative affecting a county, should be interpreted as demands or needs for additional police personnel rather than as projections of how supply would respond to needs.

Computation Equation

(27) $L_T^t = P_c^t S_e + P_b^t S_e + P_d^t S_e$

where L_T^t = Total number of law enforcement personnel needed in year t

P_c^t = M-X-related in-migrant population present in communities in year t

S_e = Standard for law enforcement personnel-population ratio = 2 per 1,000

P_b^t = M-X-related in-migrant population resident onbase in year t

and P_d^t = M-X-related in-migrant population resident in construction camps in year t

FIRE PROTECTION PERSONNEL REQUIREMENTS (TABLE 4.2-5)

The table presents baseline, M-X-related, and total requirements for fire safety personnel and the percent change over the baseline represented by the M-X-generated need for additional firemen. Unlike law enforcement services, only the population resident in communities is assumed to create demands for additional fire protection personnel. The model makes no distinction between full-time professional personnel and volunteer firemen.

Computation Equation

(28) $F_c^t = P_c^t S_f$

where F_c^t = Total number of firemen needed by communities in year t

P_c^t = Total M-X-related in-migrant population resident in communities in year t

and S_f = Standard for firement-population ratio = 1.65 per 1,000

PARKS AND RECREATION FACILITY REQUIREMENTS (TABLE 4.2-6)

Requirements, or needs, for additional playgrounds, neighborhood parks, and comunity-wide parks and total acres of park land needed by the M-X-induced in-migrant population, assuming standards developed by the National Recreation and Park Association for urban communities, are shown in the table for each alternative affecting a county or region. Requirements, which are a function of the population resident in communities, are highest during the M-X construction period but decline thereafter to permanent levels which are considerably lower. It is reasonable to conclude that communities would plan and acquire parkland to accommodate the neds of the long term rather than the peak population in order to avoid a large surplus of parkland after construction is over.

Computation Equation

(29) $R_{pc}^t = P_c^t(S_g) + P_c^t(S_n) + P_c^t(S_r)$

where R_{pc}^t = Total acres of parks needed in communities in year t

P_c^t = Total M-X-related in-migrant population present in communities in year t

S_g = Standard for playground acres-population ratio = 1.0 per 1,000

S_n = Standard for neighborhood park acres-population ratio = 1.3 per 1,000

and S_r = Standard for community-wide park acres-population ratio = 4.0 per 1,000

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APPENDIX

The unsummarized model outputs presented in the following tables represent the potential impacts to Beaver County under Proposed Action. The results are listed by employee type by year during both the short-term construction period and the long-term operations period.

REGION: BEAVER
PROPOSED ACTION: FULL DEPLOYMENT - NEVADA/UTAH
BASE I AT COYOTE SPRINGS, NV (CLARK CO.)
BASE II AT MILFORD, UT (BEAVER CO.)
14-NOV-80

EMPLOYMENT TYPE KEY

EMP1 - BASE CONSTRUCTION
EMP2 - SHELTER CONSTRUCTION
EMP3 - BASE ASSEMBLY AND CHECKOUT
EMP4 - SHELTER ASSEMBLY AND CHECKOUT
EMP5 - OPERATIONS, MILITARY
EMP6 - OPERATIONS, CIVILIANS
EMP7 - INDIRECT EMPLOYMENT

YEAR: 1982

	POPULATION			JOBS		
	COMMUNITY	BASE	CAMP	COMMUNITY	BASE	CAMP
EMP1	0.	0.	0.	0.	0.	0.
EMP2	0.	0.	0.	0.	0.	0.
EMP3	0.	0.	0.	0.	0.	0.
EMP4	0.	0.	0.	0.	0.	0.
EMP5	0.	0.	0.	0.	0.	0.
EMP6	0.	0.	0.	0.	0.	0.
EMP7	0.	0.	0.	0.	0.	0.
TOTAL	0.	0.	0.	0.	0.	0.

YEAR: 1983

	POPULATION			JOBS		
	COMMUNITY	BASE	CAMP	COMMUNITY	BASE	CAMP
EMP1	0.	0.	0.	0.	0.	0.
EMP2	0.	0.	0.	0.	0.	0.
EMP3	0.	0.	0.	0.	0.	0.
EMP4	0.	0.	0.	0.	0.	0.
EMP5	0.	0.	0.	0.	0.	0.
EMP6	0.	0.	0.	0.	0.	0.
EMP7	0.	0.	0.	0.	0.	0.
TOTAL	0.	0.	0.	0.	0.	0.

YEAR: 1984

	POPULATION			JOBS		
	COMMUNITY	BASE	CAMP	COMMUNITY	BASE	CAMP
EMP1	0.	0.	0.	0.	0.	0.
EMP2	254.	0.	78.	100.	0.	78.
EMP3	0.	0.	0.	0.	0.	0.
EMP4	0.	0.	10.	0.	0.	10.
EMP5	0.	0.	0.	0.	0.	0.
EMP6	0.	0.	0.	0.	0.	0.
EMP7	776.	0.	0.	483.	0.	0.
TOTAL	1030.	0.	88.	583.	0.	88.

YEAR: 1985

	POPULATION			JOBS		
	COMMUNITY	BASE	CAMP	COMMUNITY	BASE	CAMP
EMP1	257.	97.	0.	33.	97.	0.
EMP2	2225.	0.	653.	450.	0.	653.

EMP3	0.	0.	0.	0.	0.	0.
EMP4	0.	0.	280.	0.	0.	280.
EMP5	0.	0.	0.	0.	0.	0.
EMP6	0.	0.	0.	0.	0.	0.
EMP7	1970.	0.	0.	1397.	0.	0.
TOTAL	4254.	97.	933.	1890.	97.	933.

YEAR: 1986	POPULATION			JOBS		
	COMMUNITY	BASE	CAMP	COMMUNITY	BASE	CAMP
EMP1	1766.	663.	0.	282.	663.	0.
EMP2	2439.	0.	810.	495.	0.	810.
EMP3	0.	0.	0.	0.	0.	0.
EMP4	0.	0.	360.	0.	0.	360.
EMP5	543.	2173.	0.	0.	1080.	0.
EMP6	402.	0.	0.	180.	0.	0.
EMP7	3161.	0.	0.	2603.	0.	0.
TOTAL	8312.	2835.	1170.	3560.	1743.	1170.

YEAR: 1987	POPULATION			JOBS		
	COMMUNITY	BASE	CAMP	COMMUNITY	BASE	CAMP
EMP1	2577.	1005.	0.	430.	1005.	0.
EMP2	630.	0.	172.	166.	0.	172.
EMP3	0.	0.	0.	0.	0.	0.
EMP4	0.	0.	80.	0.	0.	80.
EMP5	1086.	4345.	0.	0.	2160.	0.
EMP6	923.	0.	0.	360.	0.	0.
EMP7	5059.	0.	0.	3662.	0.	0.
TOTAL	10374.	5351.	252.	4618.	3165.	252.

YEAR: 1988	POPULATION			JOBS		
	COMMUNITY	BASE	CAMP	COMMUNITY	BASE	CAMP
EMP1	1869.	703.	0.	312.	703.	0.
EMP2	249.	0.	0.	135.	0.	0.
EMP3	0.	0.	0.	0.	0.	0.
EMP4	0.	0.	0.	0.	0.	0.
EMP5	1629.	6518.	0.	0.	3240.	0.
EMP6	1555.	0.	0.	585.	0.	0.
EMP7	4675.	0.	0.	3635.	0.	0.
TOTAL	9977.	7220.	0.	4667.	3943.	0.

YEAR: 1989	POPULATION			JOBS		
	COMMUNITY	BASE	CAMP	COMMUNITY	BASE	CAMP
EMP1	427.	353.	0.	172.	353.	0.
EMP2	93.	0.	0.	53.	0.	0.
EMP3	0.	0.	0.	0.	0.	0.
EMP4	0.	0.	0.	0.	0.	0.
EMP5	2135.	8781.	0.	0.	1365.	0.
EMP6	2334.	0.	0.	765.	0.	0.
EMP7	3113.	0.	0.	3059.	0.	0.
TOTAL	8102.	9134.	0.	4049.	1719.	0.

YEAR: 1990

	POPULATION			JOBS		
	COMMUNITY	BASE	CAMP	COMMUNITY	BASE	CAMP
EMP1	0.	0.	0.	0.	0.	0.
EMP2	0.	0.	0.	0.	0.	0.
EMP3	0.	0.	0.	0.	0.	0.
EMP4	0.	0.	0.	0.	0.	0.
EMP5	2195.	8781.	0.	0.	4365.	0.
EMP6	2057.	0.	0.	765.	0.	0.
EMP7	1474.	0.	0.	2115.	0.	0.
TOTAL	5726.	8781.	0.	2880.	4365.	0.

YEAR: 1991

	POPULATION			JOBS		
	COMMUNITY	BASE	CAMP	COMMUNITY	BASE	CAMP
EMP1	0.	0.	0.	0.	0.	0.
EMP2	0.	0.	0.	0.	0.	0.
EMP3	0.	0.	0.	0.	0.	0.
EMP4	0.	0.	0.	0.	0.	0.
EMP5	2195.	8781.	0.	0.	4365.	0.
EMP6	2056.	0.	0.	765.	0.	0.
EMP7	0.	0.	0.	931.	0.	0.
TOTAL	4251.	8781.	0.	1696.	4365.	0.

YEAR: 1992

	POPULATION			JOBS		
	COMMUNITY	BASE	CAMP	COMMUNITY	BASE	CAMP
EMP1	0.	0.	0.	0.	0.	0.
EMP2	0.	0.	0.	0.	0.	0.
EMP3	0.	0.	0.	0.	0.	0.
EMP4	0.	0.	0.	0.	0.	0.
EMP5	2195.	8781.	0.	0.	4365.	0.
EMP6	2054.	0.	0.	765.	0.	0.
EMP7	0.	0.	0.	649.	0.	0.
TOTAL	4249.	8781.	0.	1414.	4365.	0.

YEAR: 1993

	POPULATION			JOBS		
	COMMUNITY	BASE	CAMP	COMMUNITY	BASE	CAMP
EMP1	0.	0.	0.	0.	0.	0.
EMP2	0.	0.	0.	0.	0.	0.
EMP3	0.	0.	0.	0.	0.	0.
EMP4	0.	0.	0.	0.	0.	0.
EMP5	2195.	8781.	0.	0.	4365.	0.
EMP6	2053.	0.	0.	765.	0.	0.
EMP7	0.	0.	0.	640.	0.	0.
TOTAL	4248.	8781.	0.	1405.	4365.	0.

YEAR: 1994

	POPULATION			JOBS		
	COMMUNITY	BASE	CAMP	COMMUNITY	BASE	CAMP
EMP1	0.	0.	0.	0.	0.	0.
EMP2	0.	0.	0.	0.	0.	0.

EMP3	0.	0.	0.	0.	0.	0.
EMP4	0.	0.	0.	0.	0.	0.
EMP5	2195.	8781.	0.	0.	4365.	0.
EMP6	2052.	0.	0.	765.	0.	0.
EMP7	0.	0.	0.	640.	0.	0.
TOTAL	4247.	8781.	0.	1405.	4365.	0.

REGION: PLAYER
PROPOSED ACTION: FULL DEPLOYMENT - NEVADA/UTAH
BASE I AT COYOTE SPRINGS, NV (CLARK CO.)
BASE II AT MILFORD, UT (BEAVER CO.)
14-2IV-80

HOUSEHOLDS

YEAR	EMP1	EMP2	EMP3	EMP4	EMP5	EMP6	EMP7	EMP1-4	EMP5	EMP6	EMP7	TOTAL
1982	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1983	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1984	0.	73.	0.	0.	0.	0.	277.	73.	0.	0.	277.	350.
1985	73.	579.	0.	0.	0.	0.	704.	652.	0.	0.	704.	1356.
1986	535.	697.	0.	0.	165.	144.	1130.	1201.	165.	144.	1130.	2639.
1987	765.	180.	0.	0.	329.	330.	1807.	945.	329.	330.	1807.	3410.
1988	544.	71.	0.	0.	494.	555.	1670.	605.	494.	555.	1670.	3324.
1989	265.	27.	0.	0.	665.	735.	1113.	291.	665.	735.	1113.	2804.
1990	0.	0.	0.	0.	665.	735.	526.	0.	665.	735.	526.	1926.
1991	0.	0.	0.	0.	665.	734.	0.	0.	665.	734.	0.	1399.
1992	0.	0.	0.	0.	665.	734.	0.	0.	665.	734.	0.	1399.
1993	0.	0.	0.	0.	665.	733.	0.	0.	665.	733.	0.	1398.
1994	0.	0.	0.	0.	665.	733.	0.	0.	665.	733.	0.	1398.

ANNUAL CHANGE

YEAR	EMP1-4	EMP5	EMP6	EMP7	TOTAL
1982	0.	0.	0.	0.	0.
1983	0.	0.	0.	0.	0.
1984	73.	0.	0.	277.	350.
1985	580.	0.	0.	426.	1006.
1986	511.	165.	144.	426.	1283.
1987	-256.	165.	186.	677.	771.
1988	-319.	165.	226.	-137.	-87.
1989	-313.	172.	180.	-557.	-519.
1990	-291.	0.	0.	-586.	-878.
1991	0.	0.	0.	-526.	-527.
1992	0.	0.	-1.	0.	-1.

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REGION: BEAVER
PROPOSED ACTION: FULL DEPLOYMENT - NEVADA/UTAH
BASE I AT COYOTE SPRINGS, NV (CLARK CO.)
BASE II AT MILFORD, UT (BEAVER CO.)
14-NOV-80

HOUSING TYPE: SINGLE FAMILY UNITS

YEAR	EMP1	EMP2	EMP3	EMP4	EMP5	EMP6	EMP7	EMP1-4	EMP5-6	EMP7	TOTAL
1982	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1983	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1984	0.	0.	0.	0.	0.	0.	29.	0.	0.	29.	29.
1985	19.	0.	0.	0.	0.	0.	74.	19.	0.	74.	93.
1986	132.	0.	0.	0.	35.	30.	119.	132.	65.	119.	316.
1987	291.	0.	0.	0.	86.	87.	285.	201.	173.	285.	658.
1988	140.	0.	0.	0.	155.	175.	263.	140.	330.	263.	734.
1989	70.	0.	0.	0.	244.	270.	292.	70.	515.	292.	876.
1990	0.	0.	0.	0.	314.	347.	221.	0.	661.	221.	883.
1991	0.	0.	0.	0.	384.	424.	0.	0.	808.	0.	808.
1992	0.	0.	0.	0.	419.	462.	0.	0.	881.	0.	881.
1993	0.	0.	0.	0.	419.	462.	0.	0.	881.	0.	881.
1994	0.	0.	0.	0.	419.	462.	0.	0.	881.	0.	881.

ANNUAL CHANGE

YEAR	EMP1-4	EMP5-6	EMP7	TOTAL
1982	0.	0.	0.	0.
1983	0.	0.	0.	0.
1984	0.	0.	29.	29.
1985	19.	0.	45.	64.
1986	113.	65.	45.	223.
1987	69.	108.	166.	342.
1988	-61.	158.	-22.	75.
1989	-71.	184.	29.	143.
1990	-73.	147.	-71.	6.
1991	0.	117.	-221.	-74.
1992	0.	73.	0.	73.

PROJECT: BEAVER
PROPOSED ACTION: FULL DEPLOYMENT - NEVADA/UTAH
BASE I AT CLIVE SPRINGS, NV (CLARK CO.)
BASE II AT MILFORD, UT (BEAVER CO.)
(3-NOV-83)

HOUSING TYPE: MULTIPLE UNITS

YEAR	EMP1	EMP2	EMP3	EMP4	EMP5	EMP6	EMP7	EMP1-4	EMP5-6	EMP7	TOTAL
1982	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1983	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1984	0.	0.	0.	0.	0.	0.	29.	0.	0.	29.	29.
1985	12.	0.	0.	0.	0.	0.	74.	12.	0.	74.	85.
1986	79.	0.	0.	0.	17.	15.	119.	79.	32.	119.	230.
1987	120.	0.	0.	0.	35.	35.	190.	120.	69.	190.	379.
1988	94.	0.	0.	0.	78.	87.	175.	94.	165.	175.	425.
1989	42.	0.	0.	0.	105.	116.	175.	42.	221.	175.	438.
1990	0.	0.	0.	0.	140.	154.	111.	0.	294.	111.	405.
1991	0.	0.	0.	0.	140.	154.	0.	0.	294.	0.	294.
1992	0.	0.	0.	0.	140.	154.	0.	0.	294.	0.	294.
1993	0.	0.	0.	0.	140.	154.	0.	0.	294.	0.	294.
1994	0.	0.	0.	0.	140.	154.	0.	0.	294.	0.	294.

ANNUAL CHANGE

YEAR	EMP1-4	EMP5-6	EMP7	TOTAL
1982	0.	0.	0.	0.
1983	0.	0.	0.	0.
1984	0.	0.	29.	29.
1985	12.	0.	45.	56.
1986	68.	32.	45.	145.
1987	41.	37.	71.	149.
1988	-36.	96.	-14.	45.
1989	-12.	55.	0.	13.
1990	-12.	71.	-65.	-33.
1991	0.	0.	-111.	-111.
1992	0.	0.	0.	0.

[illegible]
PROJECTED ACTIVE FIGC EMPLOYMENT - NEVADA/UTAH
BASE 1 ST (JEDF- SERIES, NV (CLARK CO.)
BASE II AF MILFOR), UT (BEAVER CO.)
18-NOV-81

HOUSING TYPE: MOBILE HOMES

YEAR	EMP1	EMP2	EMP3	EMP4	EMP5	EMP6	EMP7	EMP1-4	EMP5-6	EMP7	TOTAL
1982	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1983	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1984	0.	76.	0.	0.	0.	0.	233.	76.	0.	233.	309.
1985	46.	608.	0.	0.	0.	0.	591.	654.	0.	591.	1245.
1986	318.	731.	0.	0.	121.	106.	949.	1049.	226.	949.	2225.
1987	482.	189.	0.	0.	225.	225.	1423.	671.	450.	1423.	2543.
1988	336.	75.	0.	0.	285.	321.	1315.	411.	606.	1315.	2332.
1989	167.	28.	0.	0.	349.	386.	701.	195.	735.	701.	1631.
1990	[illegible]	0.	0.	0.	244.	270.	221.	0.	514.	221.	736.
1991	0.	0.	0.	0.	175.	193.	0.	0.	367.	0.	367.
1992	0.	0.	0.	0.	140.	154.	0.	0.	294.	0.	294.
1993	0.	0.	0.	0.	140.	154.	0.	0.	294.	0.	294.
1994	0.	0.	0.	0.	140.	154.	0.	0.	294.	0.	294.

ANNUAL CHANGE

YEAR	EMP1-4	EMP5-6	EMP7	TOTAL
1982	0.	0.	0.	0.
1983	0.	0.	0.	0.
1984	76.	0.	233.	309.
1985	578.	0.	358.	936.
1986	335.	226.	358.	920.
1987	-378.	223.	474.	318.
1988	-260.	156.	-108.	-212.
1989	-245.	129.	-614.	-731.
1990	-195.	-221.	-480.	-835.
1991	0.	-147.	-221.	-368.
1992	0.	-74.	0.	-74.

[illegible]
[illegible]: FULL DEPLOYMENT - NEVADA/UTAH
[illegible]: I-15 CORRIDOR, NV (CLARK CO.)
[illegible]: II AT MILFORD, UT (BEAVER CO.)
[illegible]

TOTAL NUMBER OF HOUSING UNITS

[illegible]	EMP1	EMP2	EMP3	EMP4	EMP5	EMP6	EMP7	EMP1-4	EMP5-6	EMP7	TOTAL
[illegible]	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
[illegible]	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
[illegible]	0.	76.	0.	0.	0.	0.	291.	76.	0.	291.	367.
[illegible]	77.	654.	0.	0.	0.	0.	739.	685.	0.	739.	1424.
[illegible]	533.	731.	0.	0.	173.	151.	1187.	1261.	324.	1187.	2771.
[illegible]	413.	169.	0.	0.	316.	346.	1897.	992.	692.	1897.	3581.
[illegible]	551.	75.	0.	0.	518.	583.	1753.	635.	1101.	1753.	3490.
[illegible]	271.	24.	0.	0.	698.	772.	1169.	306.	1470.	1169.	2945.
[illegible]	0.	0.	0.	0.	698.	771.	553.	0.	1470.	553.	2023.
[illegible]	0.	0.	0.	0.	698.	771.	0.	0.	1469.	0.	1469.
[illegible]	0.	0.	0.	0.	698.	770.	0.	0.	1469.	0.	1469.
[illegible]	0.	0.	0.	0.	698.	770.	0.	0.	1468.	0.	1468.
[illegible]	0.	0.	0.	0.	698.	770.	0.	0.	1468.	0	1468.

ANNUAL CHANGE

[illegible]	EMP1-4	EMP5-6	EMP7	TOTAL
[illegible]	0.	0.	0.	0.
[illegible]	0.	0.	0.	0.
[illegible]	76.	0.	291.	367.
[illegible]	639.	0.	448.	1056.
[illegible]	576.	324.	448.	1348.
[illegible]	-254.	365.	711.	810.
[illegible]	-357.	410.	-144.	-91.
[illegible]	-329.	363.	-585.	-545.
[illegible]	-306.	0.	-616.	-922.
[illegible]	1.	1.	-553.	-553.
[illegible]	1.	-1.	0.	-1.

1	1.	0.	0.	0.
1	1.	0.	0.	0.

[illegible] BEAVER
[illegible] WEAPONS FULL DEPLOYMENT - NEVADA/UTAH
BASE I AT COYOTE SPRINGS, NV (CLARK CO.)
BASE II AT MILFORD, UT (BEAVER CO.)
14-SEP-83

EDUCATIONAL SERVICES

		PUPILS			TEACHERS			# OF SCHOOLS	
YEAR	GRADES	COMM.	BASE	COMM. & BASE	COMM.	BASE	COMM. & BASE	COMM.	BASE
1982	K-6	0.	0.	0.	0.	0.	0.	0.0	0.0
	7-9	0.	0.	0.	0.	0.	0.	0.0	0.0
	10-12	0.	0.	0.	0.	0.	0.	0.0	0.0
	TOTAL	0.	0.	0.	0.	0.	0.	0.0	0.0
1983	K-6	0.	0.	0.	0.	0.	0.	0.0	0.0
	7-9	0.	0.	0.	0.	0.	0.	0.0	0.0
	10-12	0.	0.	0.	0.	0.	0.	0.0	0.0
	TOTAL	0.	0.	0.	0.	0.	0.	0.0	0.0
1984	K-6	122.	0.	122.	5.	0.	5.	0.2	0.0
	7-9	61.	0.	61.	3.	0.	3.	0.1	0.0
	10-12	61.	0.	61.	3.	0.	3.	0.1	0.0
	TOTAL	244.	0.	244.	10.	0.	10.	0.4	0.0
1985	K-6	592.	0.	592.	24.	0.	24.	1.2	0.0
	7-9	296.	0.	296.	13.	0.	13.	0.4	0.0
	10-12	296.	0.	296.	13.	0.	13.	0.3	0.0
	TOTAL	1183.	0.	1183.	50.	0.	50.	1.8	0.0
1986	K-6	1165.	328.	1494.	47.	13.	60.	2.3	0.7
	7-9	583.	164.	747.	25.	7.	32.	0.7	0.2
	10-12	583.	164.	747.	25.	7.	34.	0.6	0.2
	TOTAL	2331.	657.	2988.	98.	28.	126.	3.6	1.0
1987	K-6	1335.	657.	1992.	53.	26.	80.	2.7	1.3
	7-9	668.	328.	996.	29.	14.	43.	0.8	0.4
	10-12	668.	328.	996.	30.	15.	45.	0.7	0.3
	TOTAL	2671.	1313.	3984.	113.	55.	168.	4.2	2.1
1988	K-6	1237.	985.	2222.	49.	39.	89.	2.5	2.0
	7-9	619.	493.	1111.	27.	21.	48.	0.8	0.6
	10-12	619.	493.	1111.	28.	22.	51.	0.6	0.5
	TOTAL	2475.	1970.	4445.	105.	83.	188.	3.9	3.1
1989	K-6	1027.	1327.	2355.	41.	53.	94.	2.1	2.7
	7-9	514.	664.	1177.	22.	29.	51.	0.6	0.8
	10-12	514.	664.	1177.	23.	30.	54.	0.5	0.7
	TOTAL	2055.	2654.	4709.	87.	112.	199.	3.2	4.1
1990	K-6	596.	1327.	2014.	27.	53.	81.	1.4	2.7
	7-9	343.	661.	1007.	15.	29.	44.	0.4	0.8
	10-12	343.	661.	1007.	15.	30.	46.	0.3	0.7
	TOTAL	1373.	2651.	4027.	58.	112.	170.	2.1	4.1
1991	K-6	534.	1327.	1865.	22.	53.	75.	1.1	2.7
	7-9	264.	661.	933.	12.	29.	41.	0.3	0.8
	10-12	264.	661.	933.	12.	30.	42.	0.3	0.7
	TOTAL	1377.	2654.	3731.	46.	112.	158.	1.7	4.1

1992	K-6	538.	1327.	1865.	22.	53.	75.	1.1	2.7
	7-9	263.	664.	933.	12.	29.	41.	0.3	0.8
	10-12	269.	664.	933.	12.	30.	42.	0.3	0.7
	TOTAL	1076.	2654.	3730.	45.	112.	158.	1.7	4.1
1993	K-6	538.	1327.	1865.	22.	53.	75.	1.1	2.7
	7-9	263.	664.	933.	12.	29.	41.	0.3	0.8
	10-12	269.	664.	933.	12.	30.	42.	0.3	0.7
	TOTAL	1076.	2654.	3730.	45.	112.	158.	1.7	4.1
1994	K-6	538.	1327.	1865.	22.	53.	75.	1.1	2.7
	7-9	269.	664.	932.	12.	29.	41.	0.3	0.8
	10-12	269.	664.	932.	12.	30.	42.	0.3	0.7
	TOTAL	1076.	2654.	3730.	45.	112.	158.	1.7	4.1

REGION: BEAVER
PROPOSED ACTION: FULL DEPLOYMENT - NEVADA/UTAH
BASE I AT COYOTE SPRINGS, NV (CLARK CO.)
BASE II AT MILFORD, UT (BEAVER CO.)
[4-NOV-84]

PUBLIC SERVICES (PERSONNEL)

YEAR	DOCTORS	REG. NURSES	DENTISTS	MEN. HEALTH	OTHER HEALTH	HOS. BEDS	POLICE	FIREMEN
1982	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	1.4	3.9	0.4	0.2	2.2	3.6	2.2	1.7
1985	5.2	13.4	1.4	0.8	7.5	12.4	10.6	7.0
1986	9.6	26.6	2.8	1.6	14.9	22.7	24.6	13.7
1987	12.3	37.4	4.1	2.2	20.9	30.5	32.0	17.1
1988	11.5	35.0	3.9	2.1	19.6	29.2	34.4	16.5
1989	9.8	26.7	3.0	1.6	14.9	22.7	35.0	13.8
1990	5.3	15.9	1.9	1.0	8.8	14.1	29.0	9.4
1991	3.1	9.3	1.1	0.6	5.1	8.2	26.1	7.0
1992	3.1	9.2	1.1	0.6	5.1	8.2	26.1	7.0
1993	3.1	9.2	1.1	0.6	5.1	8.2	26.1	7.0
1994	3.1	9.2	1.1	0.6	5.1	8.2	26.1	7.0

MISSILE: BEAVER
PROPOSED ACTION: FULL DEPLOYMENT - NEVADA/UTAH
BASE I AT COYOTE SPRINGS, NV (CLARK CO.)
BASE II AT MILFORD, UT (BEAVER CO.)
14-MAY-80

LAND REQUIREMENTS: ACRES/(HECTARES)

	HOUSING								RESIDENTIAL STREETS			NON-RES. STREETS						
YEAR	SF	MF	MH	TOTAL	SCHOOLS	PLAYS.	PARKS	C/O SP.	ART	COL	MIN	ART	COL	MIN	RETAIL	COMM.	IND.	WASTE
1982	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.0
	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.0
1983	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.0
	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.0
1984	10.	3.	62.	74.	10.	1.	1.	4.	5.	8.	10.	8.	9.	11.	2.	2.	1.	0.2
	4.	1.	25.	30.	4.	0.	1.	2.	2.	3.	4.	3.	4.	4.	1.	1.	1.	0.1
1985	31.	9.	244.	284.	47.	4.	6.	17.	18.	32.	37.	32.	35.	41.	10.	8.	7.	0.6
	13.	4.	101.	117.	19.	2.	2.	7.	7.	13.	15.	13.	14.	17.	4.	3.	3.	0.3
1986	105.	23.	445.	573.	93.	8.	11.	33.	35.	60.	76.	62.	66.	83.	19.	15.	14.	1.2
	43.	9.	180.	232.	38.	3.	4.	13.	14.	24.	31.	25.	27.	34.	8.	6.	6.	0.5
1987	219.	38.	509.	766.	107.	10.	13.	41.	46.	74.	104.	80.	81.	115.	21.	17.	18.	1.6
	89.	15.	205.	309.	43.	4.	5.	17.	18.	30.	42.	32.	33.	46.	9.	7.	7.	0.6
1988	235.	42.	466.	753.	99.	10.	13.	40.	44.	70.	103.	78.	77.	114.	20.	17.	19.	1.5
	99.	17.	188.	304.	40.	4.	5.	16.	18.	28.	42.	32.	31.	46.	8.	7.	8.	0.6
1989	272.	44.	326.	662.	82.	8.	11.	34.	38.	55.	93.	66.	61.	103.	17.	14.	20.	1.3
	110.	18.	132.	267.	33.	3.	4.	14.	15.	22.	38.	27.	25.	42.	7.	6.	8.	0.5
1990	294.	40.	147.	482.	55.	6.	7.	23.	26.	34.	71.	46.	37.	78.	12.	10.	16.	0.9
	119.	16.	59.	195.	22.	2.	3.	9.	11.	14.	29.	19.	15.	31.	5.	4.	7.	0.3
1991	269.	29.	74.	372.	43.	4.	6.	17.	19.	22.	56.	34.	24.	62.	8.	7.	14.	0.6
	109.	12.	30.	150.	17.	2.	2.	7.	8.	9.	23.	14.	10.	25.	3.	3.	5.	0.3
1992	294.	23.	59.	382.	43.	4.	6.	17.	19.	21.	58.	34.	23.	64.	8.	6.	13.	0.6
	119.	12.	24.	154.	17.	2.	2.	7.	8.	8.	24.	14.	9.	26.	3.	2.	5.	0.3
1993	294.	23.	59.	382.	43.	4.	6.	17.	19.	21.	58.	34.	23.	64.	8.	6.	13.	0.6
	119.	12.	24.	154.	17.	2.	2.	7.	8.	8.	24.	14.	9.	26.	3.	2.	5.	0.3
1994	294.	23.	59.	382.	43.	4.	6.	17.	19.	21.	58.	34.	23.	64.	8.	6.	13.	0.6
	119.	12.	24.	154.	17.	2.	2.	7.	8.	8.	24.	14.	9.	26.	3.	2.	5.	0.3

REGION: BEAVER
PROPOSED ACTION: FULL DEPLOYMENT - NEVADA/UTAH
BASE I AT CLYDIE SPRINGS, NV (CLARK CO.)
BASE II AT MILFORD, UT (BEAVER CO.)
14-NOV-80

CAPITAL COSTS ($)

YEAR	POLICE	FIRE	GOVERNMENT	HEALTH SERVICES	LIBRARY	SUBTOTAL
1982	0.	0.	0.	0.	0.	0.
1983	0.	0.	0.	0.	0.	0.
1984	0.	0.	0.	0.	0.	0.
1985	44440.	40170.	24720.	294580.	51500.	460410.
1986	204192.	165906.	102096.	1216644.	212700.	1901538.
1987	399976.	324168.	199488.	2377732.	415600.	3715464.
1988	497952.	404586.	248976.	2966964.	518700.	4637178.
1989	478896.	389103.	239448.	2853422.	498850.	4459719.
1990	402720.	327210.	201360.	2399540.	419500.	3750330.
1991	274848.	223314.	137424.	1637636.	286300.	2559522.
1992	274848.	223314.	137424.	1637636.	286300.	2559522.
1993	204048.	165789.	102024.	1215786.	212550.	1900197.
1994	203952.	165711.	101976.	1215214.	212450.	1899303.

YEAR	HOUSING	RET. BLDG	COM. BLDG	IND. BLDG	SCHOOLS	STREETS	GRAND TOTAL
1982	0.	0.	0.	0.	0.	0.	0.
1983	0.	0.	0.	0.	0.	0.	0.
1984	1702350.	779289.	850515.	921250.	1073936.	1130431.	6918181.
1985	5275809.	3214045.	3507802.	4015000.	5218767.	4397006.	27529960.
1986	16531589.	6136228.	6697068.	8900375.	10279261.	8580502.	60863488.
1987	32732663.	6933882.	7567625.	11048125.	11778776.	11163999.	85362248.
1988	35963028.	6641179.	7248168.	11838750.	10913317.	10884542.	87948704.
1989	41387468.	5698672.	6219518.	12053251.	9061706.	9266967.	87437920.
1990	38871512.	3928464.	4287518.	9961875.	6054231.	6438723.	74101848.
1991	35706644.	2731913.	2992518.	8333876.	4747473.	4781611.	61204232.
1992	38442304.	2459305.	2683030.	7335125.	4745701.	4824798.	62891308.
1993	38422216.	2458286.	2671235.	7333750.	4744815.	4823557.	62847716.

1991	34312428.	2150246.	2671236.	7933750.	1743930.	1922325.	62835360.

REGION: BEAVER
PROPOSED ACTION: FULL DEPLOYMENT - NEVADA/UTAH
BASE I AT CEDAR SPRINGS, NV (CLARK CO.)
BASE II AT MILFORD, UT (BEAVER CO.)
14-NOV-80

UTILITIES ($)

	RESIDENTIAL			NON-RESIDENTIAL			SYSTEM WIDE			
YEAR	SANITARY	WATER	GAS/ELEC.	SANITARY SEWAGE	WATER	GAS/ELEC.	SANITARY SEWAGE	WATER	GAS/ELEC.	GRAND SUM
1982	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1983	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1984	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1985	226140.	146991.	151248.	90456.	29398.	30250.	126638.	70556.	54449.	926126.
1986	874362.	568335.	579964.	349745.	113667.	115993.	489643.	272801.	208787.	3573297.
1987	1742961.	1132925.	1180771.	697184.	226585.	236155.	976058.	543804.	425079.	7151525.
1988	2335973.	1518382.	1624623.	934389.	303676.	324925.	1308145.	728824.	584864.	9663801.
1989	2312165.	1496615.	1618139.	920994.	299323.	323628.	1289392.	718375.	582530.	9551481.
1990	2029775.	1319354.	1467250.	811910.	263871.	293450.	1136674.	633290.	528210.	8483784.
1991	1445520.	965653.	1117886.	594248.	193131.	223577.	831947.	463514.	402439.	6278016.
1992	1445520.	965653.	1117886.	594248.	193131.	223577.	831947.	463514.	402439.	6278016.
1993	1146139.	744991.	881646.	458456.	148998.	176329.	641838.	357595.	317392.	4873384.
1994	1174927.	763703.	911744.	469971.	152741.	182349.	657959.	366577.	328228.	5008199.

REGION: BEAVER
PROPOSED ACTION: FULL DEPLOYMENT - NEVADA/UTAH
BASE I AT COYOTE SPRINGS, NV (CLARK CO.)
BASE II AT MILFORD, UT (BEAVER CO.)
14-NOV-80

YEAR	WATER USE	WASTE WATER USE	LBS. SOL. WASTE	CUB. YDS. SOL. WASTE	LIN. FT. OF STREETS
1982	0.	0.	0.	0.	0.
1983	0.	0.	0.	0.	0.
1984	236030.	128750.	5150.	2503.	35779.
1985	853830.	531750.	21270.	10337.	139025.
1986	1662430.	1039000.	41560.	20198.	272762.
1987	2073830.	1296750.	51870.	25209.	357741.
1988	1995400.	1247125.	49885.	24244.	349742.
1989	1674030.	1048750.	41950.	20388.	309699.
1990	1145230.	715750.	28630.	13914.	212026.
1991	850200.	531375.	21255.	10330.	159445.
1992	849900.	531125.	21245.	10325.	161739.
1993	849600.	531000.	21240.	10323.	161698.
1994	849400.	530875.	21235.	10320.	161656.

Table A-2. Estimation of average household size for the baseline population, by county.

COUNTY	1970 CENSUS			ESTIMATED PERCENT CHANGE IN STATE AVERAGE HOUSEHOLD SIZE (1970-77)	ESTIMATED COUNTY AVERAGE HOUSEHOLD SIZE 1977
	POPULATION	OCCUPIED HOUSING UNITS	ESTIMATED AVERAGE HOUSEHOLD SIZE		
Nevada					
Clark	273,288	87,728	3.12	-10.39	2.80
Eureka	948	347	2.73	-10.39	2.45
Lincoln	2,557	792	3.23	-10.39	2.89
Nye	5,599	1,813	3.09	-10.39	2.77
White Pine	10,150			-10.39	2.92
Utah					
Beaver	3,800	1,191	3.20	-6.98	2.98
Iron	12,177	3,378	3.60	-6.98	3.35
Juab	4,574	1,390	3.29	-6.98	3.06
Millard	6,988	2,094	3.34	-6.98	3.11
Salt Lake Urban	596,383	169,399	3.52	-6.98	3.32
Washington	13,669	3,834	3.57	-6.98	3.32
Texas					
Bailey	8,487	2,503	3.39	-8.87	3.09
Castro	10,394	2,705	3.84	-8.87	3.50
Cochran	5,326	1,505	3.54	-8.87	3.23
Dallam	6,012	2,011	2.99	-8.87	2.72
Deaf Smith	18,999	5,177	3.67	-8.87	3.34
Hartley	2,782	878	3.17	-8.87	2.89
Hill	34,137	10,228	3.34	-8.87	3.04
Hockley	20,396	5,915	3.45	-8.87	3.14
Lamb	17,770	5,627	3.16	-8.87	2.88
Lubbock	179,295	53,253	3.37	-8.87	3.07
Moore	14,060	4,263	3.30	-8.87	3.01
Oldham	2,258	583	5.87	-8.87	3.53
Parmer	10,509	3,028	3.47	-8.87	3.16
Potter Randall	144,396	47,181	3.06	-8.87	2.79
Stevans	3,657	1,123	3.26	-8.87	2.97
Swisher	10,373	3,150	3.29	-8.87	3.00
New Mexico					
Chaves	43,324	13,174	3.29	-12.15	2.89
Curry	39,517	11,462	3.45	-12.15	3.03
De Baca	2,547	905	2.81	-12.15	2.47
Harding	1,260	434	2.90	-12.15	2.55
Quay	10,903	3,642	2.99	-12.15	2.63
Roosevelt	16,479	5,108	3.23	-12.15	2.84
Union	4,925	1,629	3.02	-12.15	2.65

Source: HDR Sciences from U.S. Bureau of the Census data.

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